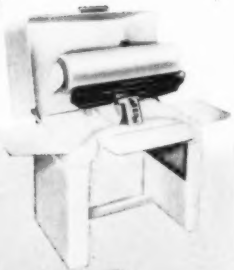
MODERN PLASTICS

SEPTEMBER 1950

It pays to use your custom molder's know-how

in such matters as Restyling without Retooling



No. 21 in a Series on Plastics Skill at Work...

PROJECT: Modernized thermostat control selector
CUSTOMER: Ironrite Inc., Mt. Clemens, Mich.
MOLDER: Molded Products Company, Detroit
MATERIAL: Durez heat-resistant phenolic plastic

OLD MODEL three-position thermostat control required users to have some knowledge of fabrics' heat resistance for most satisfactory results in ironing. Ironrite engineers devised foolproof replacement.

HOUSING ON IMPROVED MODEL, plainly marked for ironing six types of material, was obtained without the cost of a new mold. Heat resistance, dielectric properties, and lustrous "built-in" finish are among characteristics that make Durez ideal for such parts.

Good ideas for product improvement are often held up by the red light of high retooling cost. But when you're working with plastics, count on your custom molder's ingenuity. He can often find a way to justify a go-ahead signal—and a product that people like more.

In this case the molder helped Ironrite Inc. to cut costs on a modernized thermostat selector control that leaves nothing to the housewife's imagination. Replacing a three-position indicator, the new one has six temperature stops—one for each of the types of material most commonly ironed.

A new mold could have cost plenty. So instead, the molder worked out alterations to adapt the existing 4-cavity mold to the new dial design. Results: saving on retooling cost was enough to pay for about a half-year's supply of the new ironer part. And time, too, was saved on the changeover.

Many successful plastics users call in their custom molders before things get beyond the planning stage. This permits the molder to aid most constructively in using the versatile properties of Durez and other plastics. Our Durez phenolics specialists are always available for consultation with your designers, engineers, and molders.

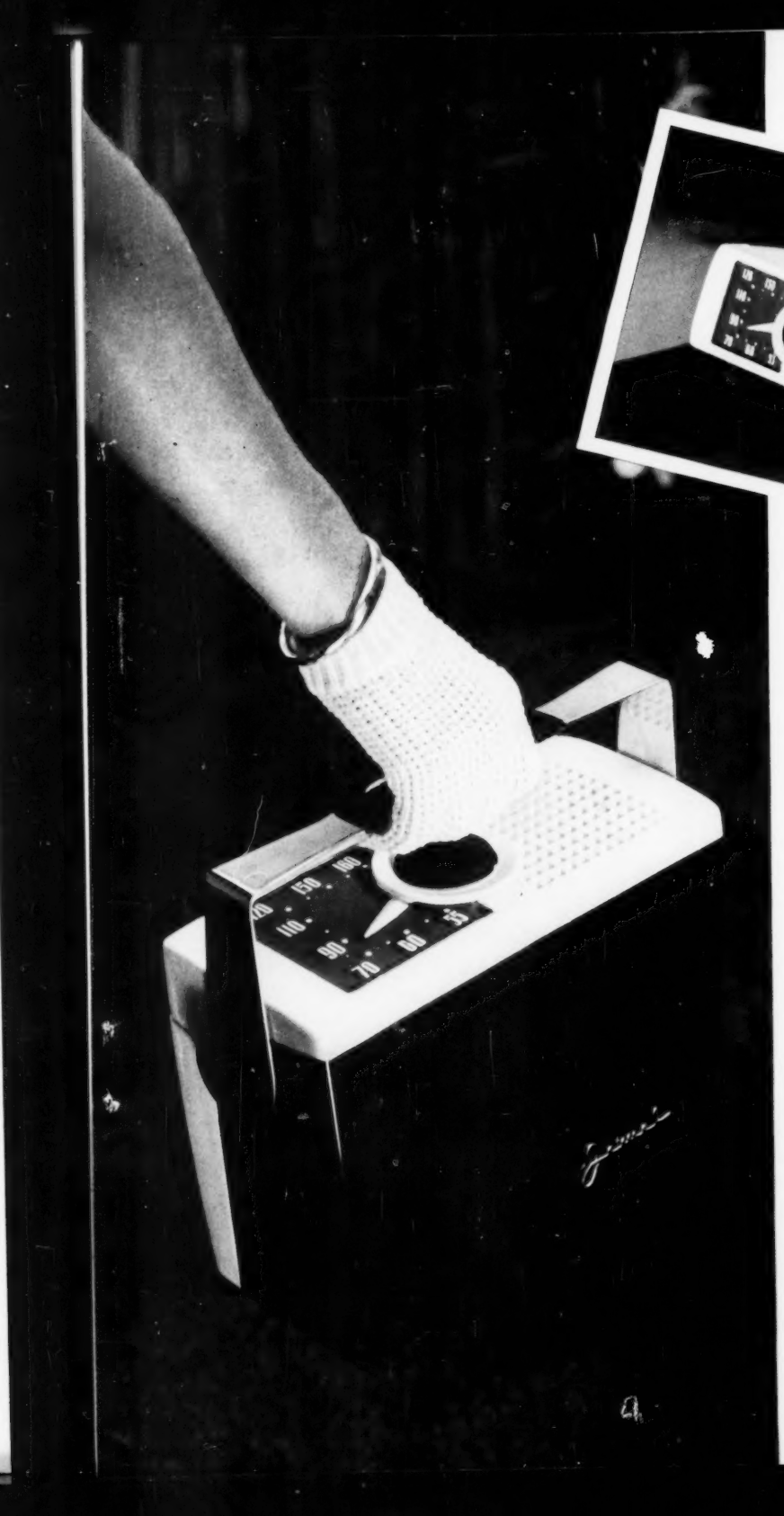
Our monthly "Durez Plastics News" contains many useful ideas. May we place you on the list? Durez Plastics & Chemicals, Inc. 129 Walck Rd., N. Tonawanda, N. Y.

DUREZ

PHENOLIC RESINS

- MOLDING COMPOUNDS
- INDUSTRIAL RESINS
- PROTECTIVE COATING RESINS

PHENOLIC PLASTICS THAT FIT THE JOB



THE NEW *Jewel* IN A SPARKLING SETTING OF

Catalin STYRENE

Ingeniously molded by TECH-ART PLASTICS COMPANY, *the housing of this companionable radio is formed of several precision-fitting* CATALIN STYRENE *components . . . thus permitting rich color combinations—dramatic contrast—and a setting worthy of the* JEWEL!

As designed by Bronislaw Zapolski for JEWEL RADIO CORPORATION *of Long Island City, N.Y., the cleverly planned handle of the model pictured serves a dual purpose; swings from an upright carrying position into a smartly elevated table rest.*

With CATALIN STYRENE *specified, your next plastic application can have new beauty too, at favorable cost! Our service staff will be glad to assist you in planning. Inquiries invited!*

CATALIN CORPORATION OF AMERICA
ONE PARK AVENUE • NEW YORK 16, N. Y.

MODERN PLASTICS*

VOLUME 28 SEPTEMBER 1950 NUMBER 1

CONTENTS

GENERAL SECTION

What Mobilization Means to Plastics (Editorial) ... 5

Soft Products for Hard Use ... 73
Rapidly advancing in diversity of application are the versatile elastomeric vinyls

New Fields for Ion Exchange Resins ... 79
by Paul Kloos
Synthetic resins branch out from water conditioning into the food, drug, metals, and other industries

Models Make Money ... 81
How eye-appeal of a product can be proved before molds are made

Drive-In Movie Speakers Take a Beating ... 82
Phenolic housings replace metal; costs are comparable, results are superior

Extruding Over Wood ... 84
Dowels, rods, and slats take on a new, permanent finish

Interpreting Plastics Statistics ... 86
Aids in reconciling all the different industry figures

Injection Molded Squeeze Bottles ... 88
Two molded parts are welded together to make a leakproof one-piece unit

Plastics and Defense ... 88A
How military needs may affect the industry in the immediate future

Embossing Upgrades Vinyl ... 89
New developments in embossing and printing give added beauty to film and sheeting

Plastics Products ... 92
Photos and descriptions of the latest in plastics merchandise

Moth Killer Pack ... 151

Stamp Gage and Magnifier ... 152

Crib and Cradle ... 154

Barograph ... 155

Labeling Tape ... 157

Rail Tie Pads ... 158

Automatic Electric Fly Control ... 162

Watch Box ... 164

PLASTICS ENGINEERING

One-Piece Freezer Breaker Frame ... 97
by Robert W. Barber
Problems of molding an unusual piece—and how they were solved

Printed Sheets Precision Formed ... 105
by E. Bowman Stratton, Jr.
Low-cost production of three-dimensional shapes with accurate registry of printing

Extruder-Compounder ... 111
Two meshing screws of constant diameter revolve in opposite directions

TECHNICAL SECTION

Organic Polyvinyl Ester Production in Germany ... 113
by Norbert Platzer
Preparation of materials and a historical survey of German production

DEPARTMENTS

Plastics Digest ... 122

U. S. Plastics Patents ... 126

New Machinery and Equipment ... 132

Books and Booklets ... 140

International Plastics News ... 146

Production of Plastics Materials ... 148

THE PLASTISCOPE ... 172

News of the Industry; Predictions and Interpretations; Company News; Personal; Meetings

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*Reg. U. S. Pat. Office

Venetian blind of Flexalum courtesy of Hunter Douglas Corp., New York, N.Y. and Riverside, Calif.

Eye-opening idea FOR A BETTER BLIND

Another salesmaker from Geon plastic materials

HERE'S a venetian blind with revolutionary construction improvements made possible by the versatile qualities of Geon paste resin.

The tapes are made from Geon paste resin with supporting fibers integrated for strength and durability. These tapes won't fade, shrink or stretch—they are extremely moisture-and-sun resistant. A wipe of a damp cloth cleans them like new. Note the patented feature by which the Geon-coated aluminum cross members are fused right into the tape for strength.

Here's another example of how Geon's wide range of qualities helps develop new products. For Geon is used in electrical cable, flooring, curtains, toys, shoes—a growing list of products which are created or improved by the use of this versatile material. Geon can be cast, molded, extruded, calendered, or used as a coating.

Does this give you an idea for a product that Geon will perfect or improve? If so, write us and we will be glad to give you the technical help necessary to turn it into a saleable product. We make no finished products ourselves—supply the raw materials only. Write Dept. GA-9, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. In Canada: Kitchener, Ontario. Cable address: Goodchemco.

B. F. Goodrich Chemical Company

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CHICAGO MOLDED

. . . the answer to many of today's small mechanical parts problems

Molded nylon has long since proved itself one of the most valuable materials for the fabrication of small mechanical parts. It is exceptionally tough and resistant to abrasion. It has a tendency to dampen vibration and lessen noise and, when used for bearings, requires little or no lubrication. Furthermore, it is not affected by petroleum oils and greases, alkalis and dilute acids.

These qualities make molded nylon ideal for a host of mechanical parts such as gears, bearings, pawls, grommets, cams, bobbins, washers, and similar units.

But . . . nylon alone won't do the job. Its fabrication requires a special "know-how" that comes only with long experience in molding this remarkable material.

We've been molding nylon ever since Du Pont first made it available. We've learned its peculiarities, its characteristics, and its molding behaviour. We understand its possibilities as well as its limitations. This experience is of utmost importance to anyone who contemplates the use of molded nylon.

Yes . . . we mold nylon . . . and all other plastics materials. We have practically unlimited facilities for compression, injection and plunger molding. Our huge batteries of presses include every needed size and type for maximum efficiency and production economy. And . . . most important . . . we have a background of more than 30 years in plastics.

No matter what your molded plastics job may be, you'll find this a good place to do business. Why not discuss plans with a Chicago Molded engineer? Just write, wire or phone. There's no obligation.

YOU'LL WANT THESE FACTS ABOUT NYLON

We have prepared an interesting bulletin which contains worthwhile information about nylon, its qualities and properties, and discusses many typical applications. Write for your free copy.

CHICAGO MOLDED PRODUCTS CORPORATION

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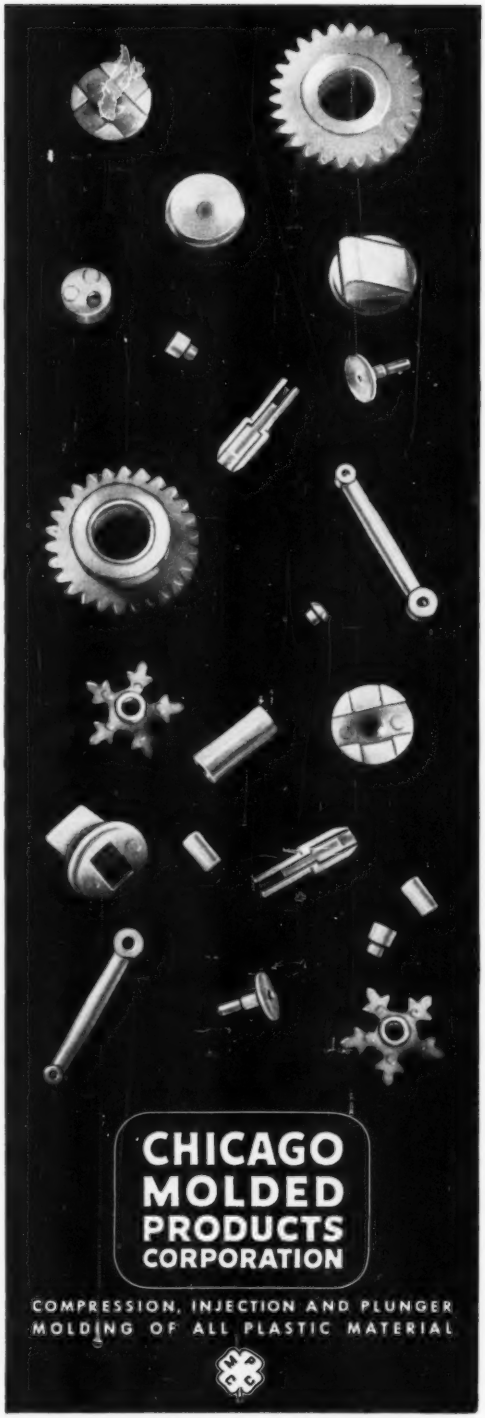
Representatives in principal industrial centers



What Mobilization Means to Plastics

A special insert in this issue following page 88 presents the picture at Washington as MODERN PLASTICS is best able to draw it.

The picture, while far from clear in detail, is quite understandable in outline. It is not a picture of crisis, of desperation, or of emotional decision. It is a picture of carefully planned and concerted movement of a major portion of the country's economy toward a position of adequate mobilization and war materiel sufficiency.

As we see it, the process of building up equipment and supplies will be relatively slow and steady, involving as little dislocation of the domestic economy from the supply standpoint as possible. Some materials and industrial facilities will be affected sooner than others, and not all will be affected in like measure. Polyethylene, already on allocation, will quite likely become tighter in supply until promised new production comes in—and even then it is likely that civilian uses will be limited to only the most essential. That is probably the most serious example. At the other and brighter end of the picture, the cellulosics and ureas are not likely to be at all short for a long time to come. Between the two are all the other resins in various strategic positions and in positions that are constantly shifting to some degree.

Naturally, future markets for plastics products and components will depend on the availability of materials, as well as on the needs of the Armed Services for materials and facilities.

One thing is certain: just as the nation must keep its economy in as even balance as possible while achieving mobilization, so each manufacturer must fit himself and his facilities into the mobilization picture.

We have found it to be the experience of most businessmen that selling to the Armed Services is essentially the same process as selling to industry and to the distributive trades. There is not and will not be any single list of procurement officers to whom manufacturers, molders, fabricators, laminators, and processors may go to secure business. Rather, there are many lists. And MODERN PLASTICS will endeavor to give the sources of those lists of most interest to those in this industry. It will then be up to the businessman to approach these prospects on his own, to find out what their particular needs are likely to be and which of those needs he can fill most efficiently and economically.

But don't forget: Uncle Sam demands higher resistances to heat, impact, chemical attack, and moisture in his products than does the consumer. Military applications generally involve closer tolerances than those required by consumer goods. Molders and other processors will also be well advised to study and to learn how to work with the newer plastics—the fluorene groups, the co- and ter-polymers, and others. Some of these, for which consumer goods markets are quite limited, are absolutely essential for military application.

Never was a nation better equipped to cope with any future from an industrial standpoint. Never was there less reason for business men to get excited or worried. Mobilization it is; but mobilization on a planned, non-emergency basis.

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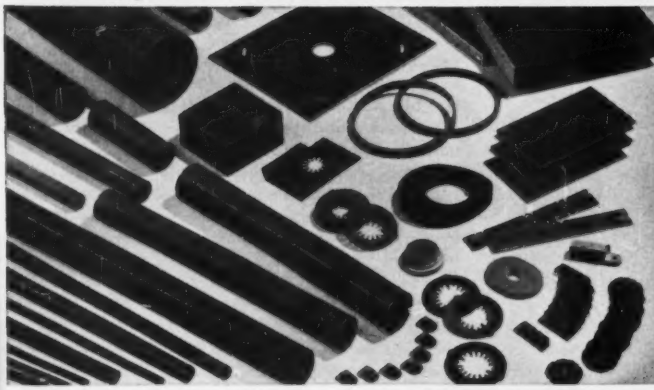

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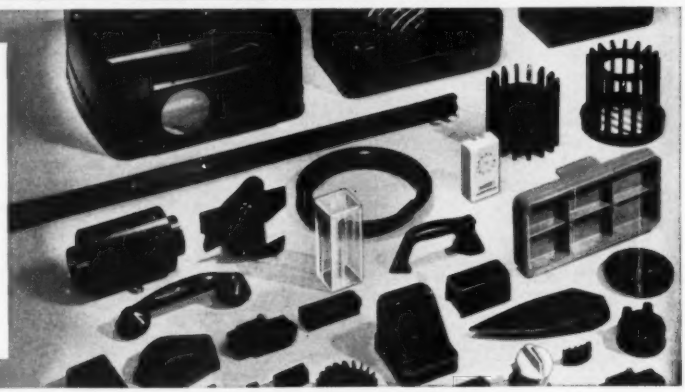
Parts made to your specifications with various granular or chopped fabric base materials. Produced by compression, injection, or transfer process. Metal inserts can be molded into position.



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Experienced engineers analyze your requirements and help you select material, form, and process best suited to your needs.

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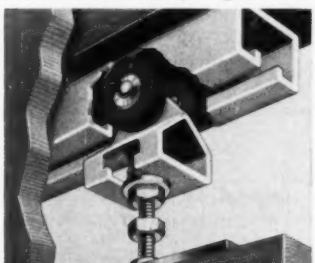
THERE'S A HUSHED-UP STORY BEHIND THIS SLIDING DOOR

Nylon rollers operate quietly, smoothly in sliding doors, show no wear after tests equaling 50 years' use

Sliding doors like the one shown here *have* been hushed up. They operate more quietly, more smoothly than ever—with far less lubrication—on rollers of Du Pont nylon plastic. In the case of this door hardware, made by Grant Pulley & Hardware Co., Woodside, N. Y., the nylon part makes up the complete outer race, or rotating member, of the ball-bearing roller.



CUTAWAY shows nylon rollers in place on sliding door. The part is injection-molded. Ball race is machined right in the plastic. Steel parts of the inner race are then assembled with the steel balls to form a complete ball-bearing unit.

As for durability, the nylon rollers have been subjected to tests rated at the equivalent of 50 years' use, with loads rated at 50 pounds. At the end of the test, the nylon parts showed no measurable wear!

Manufacturers are finding many related uses for these quiet, efficient nylon rollers—slides and rollers for file cabinets and stove drawers, wheel bearings for toys, carriages, light-duty industrial equipment and many others.

This is a typical story of product improvement at no extra cost, for which parts molded of nylon are proving so successful. Can nylon plastic solve a problem for you? Write today for helpful facts about this and other versatile Du Pont plastics. E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Dept., Sales Offices: 350 Fifth Avenue, New York 1, N. Y.; 7 S. Dearborn St., Chicago 3, Ill.; 845 E. 60th Street, Los Angeles 1, Calif.

NYLON ROLLERS *molded by Arnold Brilhart, Ltd., Mineola, N. Y.; bearing assembly manufactured by The Schatz Manufacturing Co., Poughkeepsie, N. Y.*

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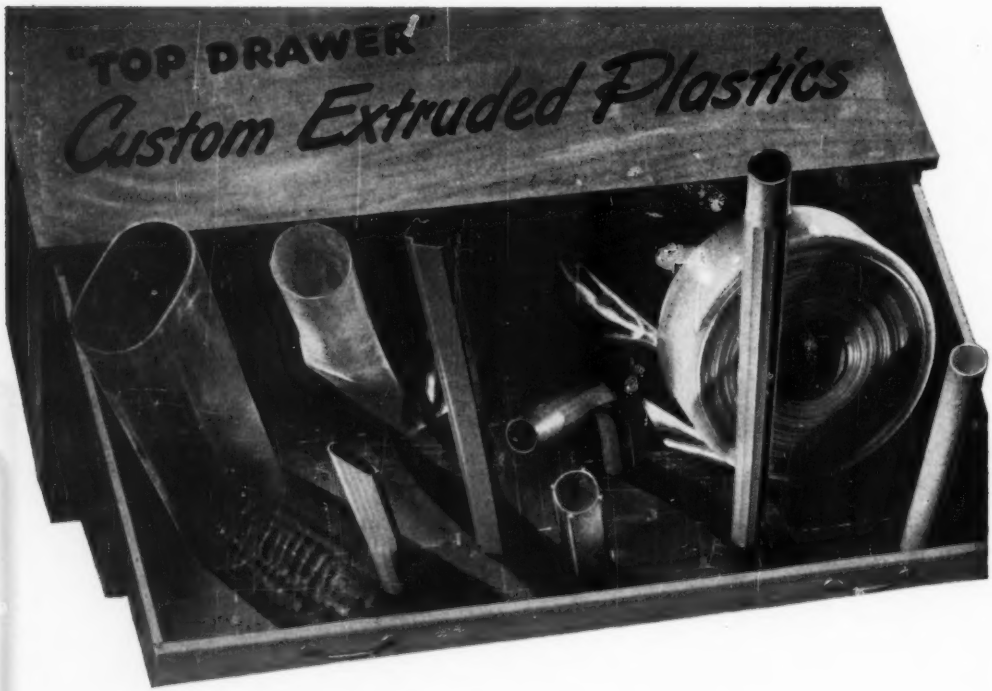

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Mold "Islander" Uke

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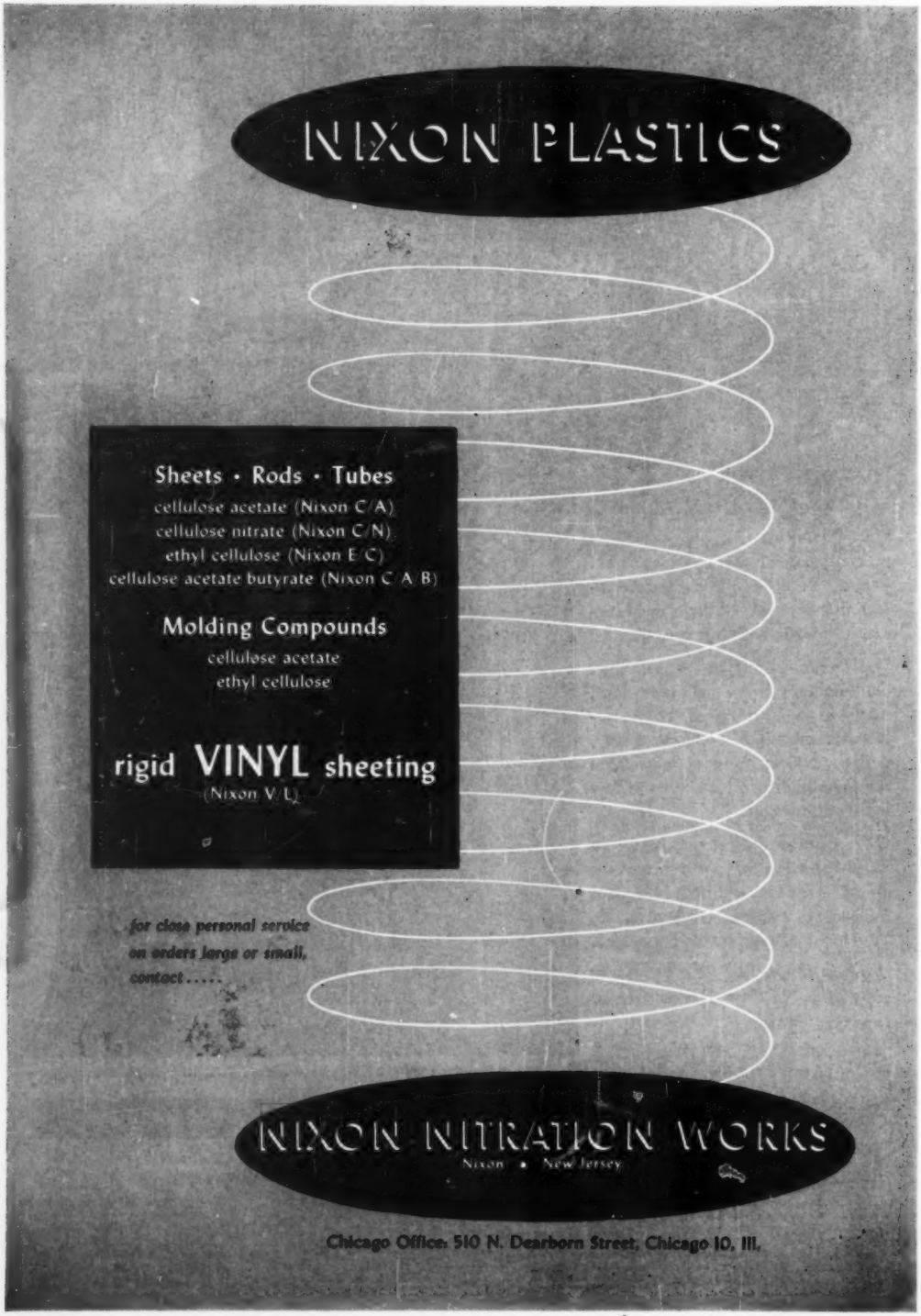
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watch your extruder's "*life expectancy*"

The design of vital parts and the introduction of new plastic materials are the major items which influence the obsolescence of extrusion machinery.

MPM extruders are insured against being outmoded as a result of *either* of these two factors.

With prolonged use, such as any piece of machinery is bound to receive, parts which are plated may wear thin and expose the less resistant under metals. MPM uses corrosion resistant materials through and through to build its extruder screws, strainers, cylinders, die heads, hoppers and all other parts which contact plastic resins. These parts, as well as the gears, drives and electrical wiring of MPM extruders are designed to render long, troubleless service and production.

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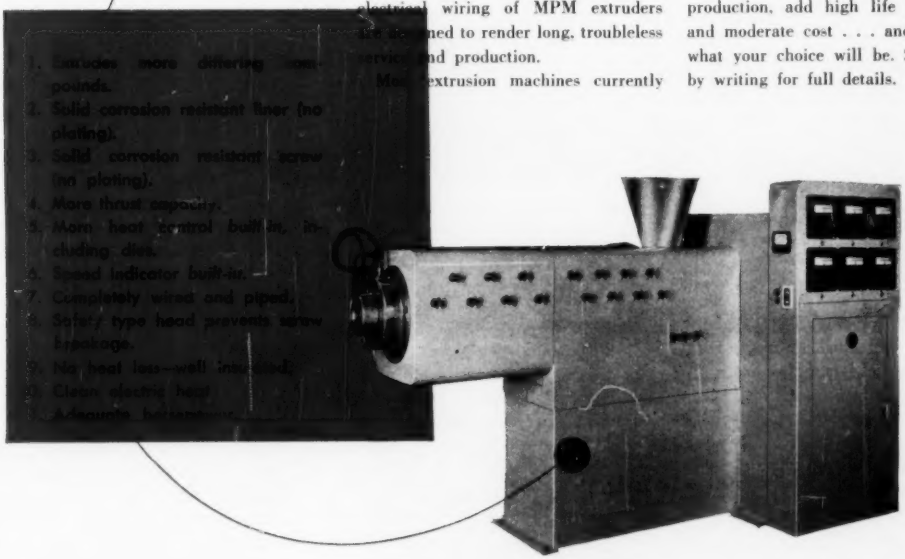
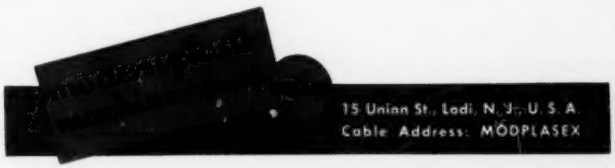
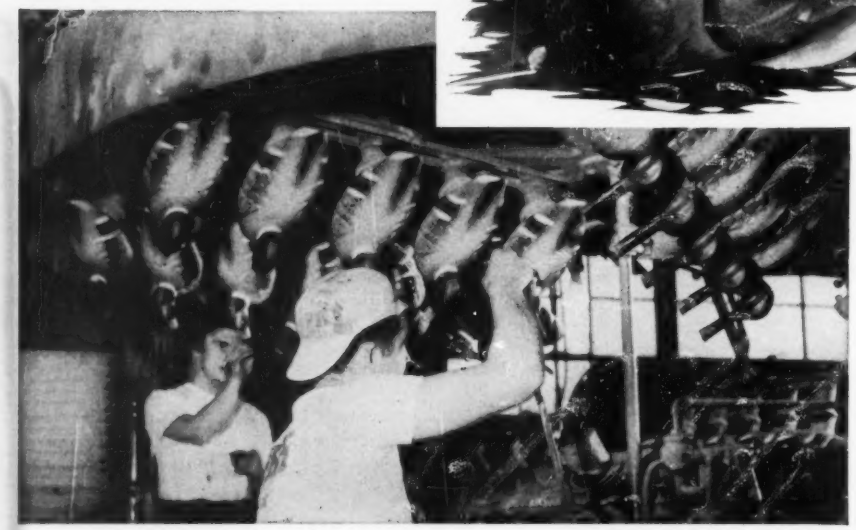
When you select extrusion machinery, be sure to examine its life expectancy. Compare MPM versatility and production, add high life expectancy and moderate cost . . . and we know what your choice will be. Start today by writing for full details.





Another successful development using the AMERICAN ANODE *process*

Ducks "HATCHED" by the thousands!



Self-inflating decoys produced by AMERICAN ANODE process

HERE'S a picture of the ingenious production line of the Intermountain Rubber Company of Salt Lake City, Utah, manufacturer of "Deeks" collapsible, lightweight decoys.

These decoys have several remarkable features that give them a big advantage over the old-fashioned type. Hunters can carry a dozen decoys in their pockets because each one weighs only 3 ounces. They inflate when thrown in the water, which seals in the air. As they float in the water, they are remarkably lifelike.

This is another example of how the American Anode process makes possible ingenious production techniques. It is a patented method whereby latices and mixes are deposited and converted to solid materials — on a wide variety of forms. This process is available to prospective manufacturers under a simple and generous licensing arrangement.

American Anode can set it up in your plant, supply you everything you need from materials to machinery. Or, we can do a complete job for you in our own factory—from start to finish.

If your products are in the textile, paper, toy manufacturing or electroplating fields, check with American Anode. We may be able to help you improve them, or develop new profit-makers for you. For complete information, please write Dept. AC-5, American Anode Inc., 60 Cherry Street, Akron, Ohio.

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From 2... to 200 oz.

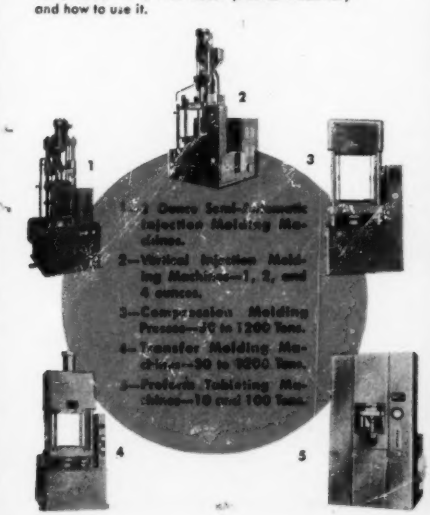
...and, all are obtainable from one source of supply—Watson-Stillman.

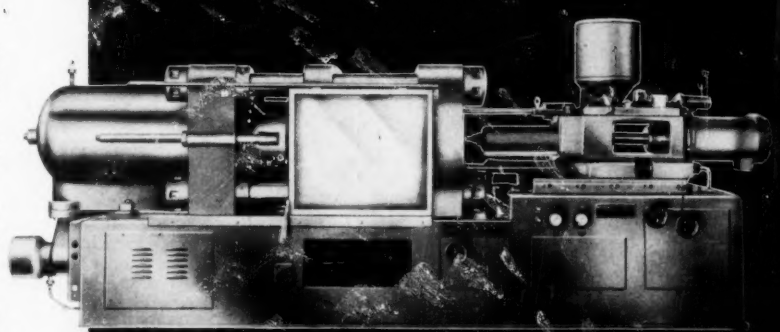
Since the very inception of the industry over 50 years ago, Watson-Stillman engineering ingenuity has paced the industry, year after year, with outstanding plastics molding machinery advancements.

Today, from the W-S "COMPLETELINE" of Injection, Transfer and Compression Molding Machines, you can select a model to fit every production requirement—large and small.

And, W-S offers many additional services. Mold designs, material selection, operation, maintenance, plant layout, are all subjects about which W-S is in a particularly good position to give advice to its clients as a part of its "COMPLETELINE" service.

When planning plant extension or a new business, consult W-S *first* about plastics machinery and how to use it.





Horizontal Injection Molding Machines—8 to 120 Ounces

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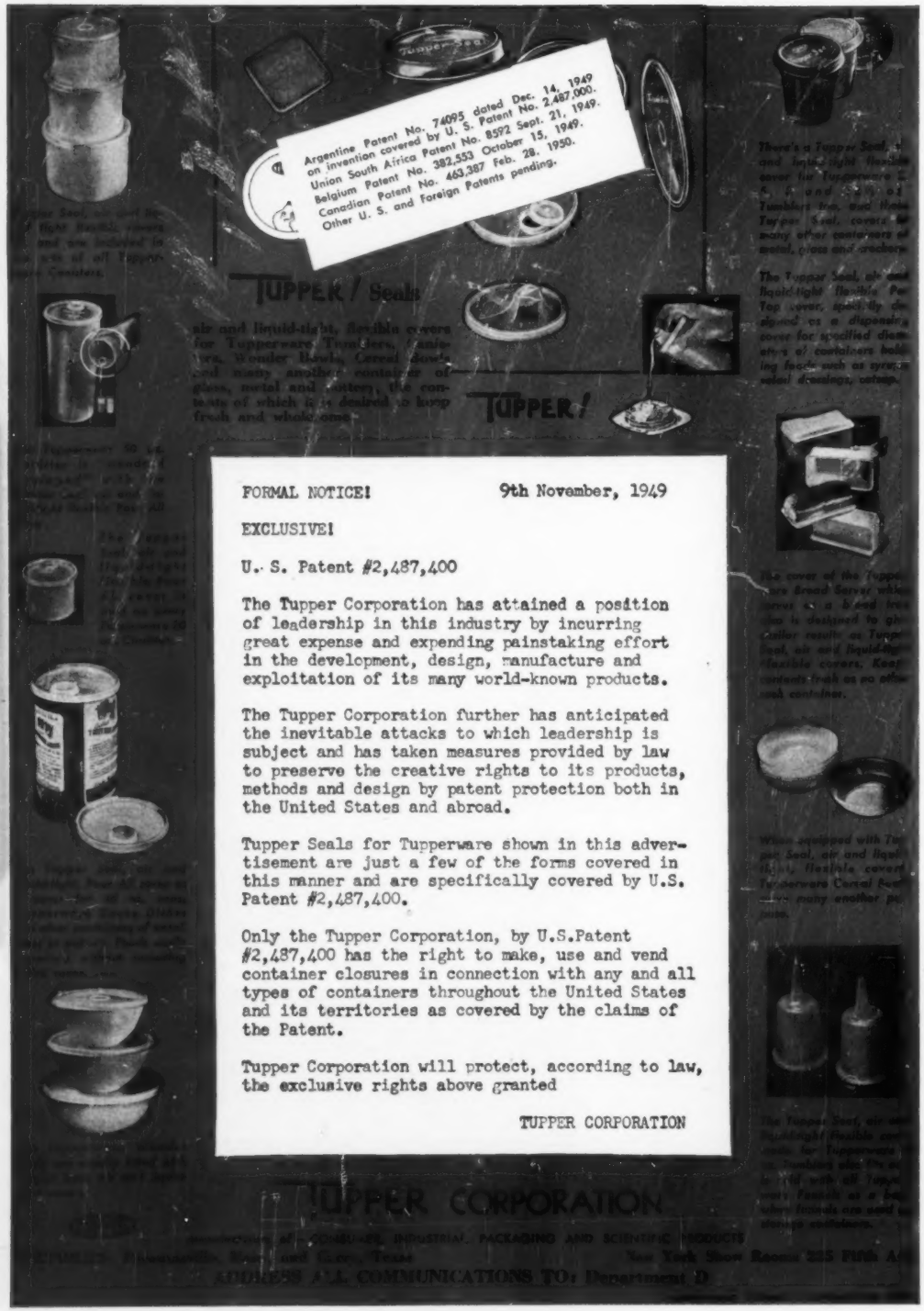
Argentine Patent No. 74095 dated Dec. 14, 1949
on invention covered by U. S. Patent No. 2,487,000.
Union South Africa Patent No. 8572 Sept. 21, 1949.
Belgium Patent No. 482,553 October 15, 1949.
Canadian Patent No. 463,387 Feb. 28, 1950.
Other U. S. and Foreign Patents pending.
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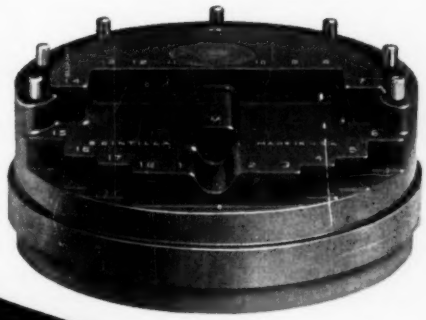
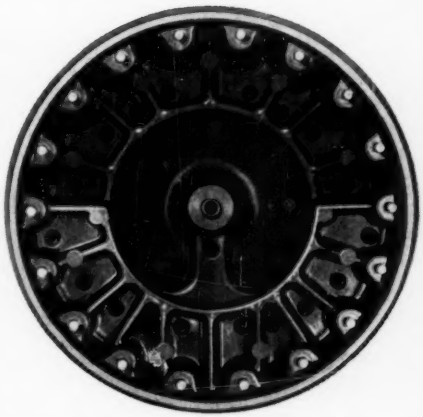


Distributor head for Scintilla Magneto Division, Bendix Aviation Corp. Moulder, Kurz-Kasch.



Here's a guidepost for you, whatever your interest in plastics. Here's everything that's excellent in plastics—type of application—specialized material—design—mouldmaking—moulding. Today, as in World War II, this Scintilla distributor head is considered an all-time plastics classic. We're still producing it (from the original moulds) for use in two of America's best-known aircraft engines. The special Melmac material formulated for this job gives a piece that is both heat and cold-resistant for high-altitude engine performance. It is highly stable, has high impact and dielectric strength, is non-crack, and will not support combustion. The piece is transfer moulded from electronically preheated preforms, and contains 26 inserts of 7 different types. Finishing operations include electronic inspection for arcing and tracking. Final result is one of the finest distributor heads ever developed.

Looking for a custom moulder? Why not choose one who's played a vital part in the industry's most famed production! Us . . . Kurz-Kasch! We have *all* the facilities. Just call.

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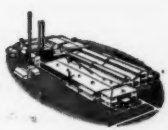


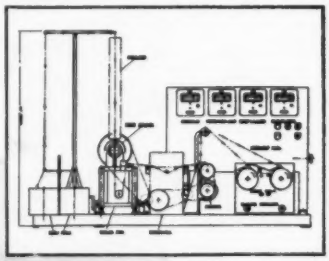
PLASTICS MACHINERY BULLETIN

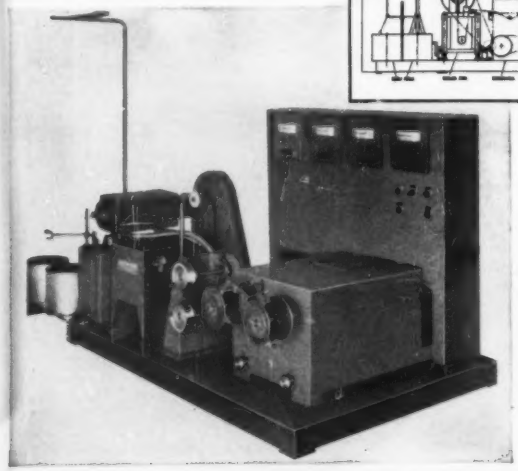
Reporting News and Machine Design Developments

IN BUSINESS TO **NRM** REDUCE YOUR COSTS

Fast, efficient nylon covering for small diameter wire with New NRM Bench Type Nylon Wire Covering Extruder

Shown below are a photo and elevation plan of the NRM 1″ Bench Type *Nylon* Wire Covering Extruder. This new machine is complete and compact, especially designed for covering small diameter (magnet) wires with *nylon* compound. The unit is fast and efficient; covers wire from #24 to #36 B & S gauge up to 1,600 ft. per minute—depending upon wire and covering sizes.





NRM 1″ Bench Type *Nylon* Wire Covering Unit—complete with electrically heated extruder, let-off, cooling tank, spark tester, dual capstan, dual take-up, instrument and control cabinet including all drives and controls. All details and quotations furnished on request. *Write now for full information.*

Another "first" in extrusion! ACETATE AND ACRYLIC POWDER EXTRUSION NOW POSSIBLE WITH NEW NRM TWO-STAGE EXTRUDER

A new NRM two-stage extruder has been proved in tests to dry and extrude pre-blended acetate and acrylic compounds, to be pelletized direct at the die or in a chopper. This means reduced production costs by eliminating the initial compounding and drying steps. The new machine is the first single screw extruder to incorporate colloiding, devolatilizing and extruding features; similar in many respects to standard NRM plastics extruders and is possible to modify certain NRM exising extruders now in the field. Get complete details by writing NRM at Akron, Ohio.

NEWS OF POLYVINYL CHLORIDE SHEETING PRODUCED BY NRM's EXPANDED TUBING METHOD

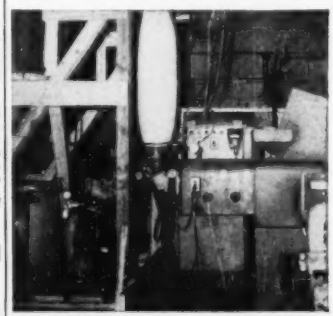
Development well under way; process is now satisfactory for certain markets

Polyvinyl chloride sheeting men have long kept a hopeful eye on the tremendous savings that will become possible through the adaption of standard extruding machines for polyvinyl chloride sheeting. The possible savings in initial machinery is well known.

NRM has perfected expanded tubing dies and screw designs to a point where small gauge (.002″) polyvinyl chloride sheeting is obtainable in acceptable quality from a compound in powdered form. NRM is continuing to explore and develop possibilities of polyvinyl chloride sheeting extruded by expanded tubing method.

The success of this low-cost production method depends to a major degree on NRM customers, prospects and their demands. It is up to the user of sheeting to work with NRM in running tests on his own type of compound. In many cases costs may be reduced still further and sheeting quality built only through close cooperation of the user with NRM.

NRM invites polyvinyl chloride sheeting users to contact material suppliers for details on polyvinyl chloride compounds suitable for extruding. Then come to NRM and we will work with you and demonstrate to you the quality of vinyl sheeting you can obtain by the expanded tubing process using standard NRM extruders and auxiliary equipment. Write NRM at Akron for complete details!



Standard NRM extruder shown is producing sheeting of Geon polyvinyl plastic by expanded tubing process. Sheeting is .015′ gauge. The "tube" has approximately a 12¾′ diameter for 40′ sheet width.

NATIONAL RUBBER MACHINERY CO. General Offices & Engineering Laboratories Akron 3, Ohio

PLANTS at Akron and Columbiana, Ohio and Clifton, N. J.
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Creative Engineering

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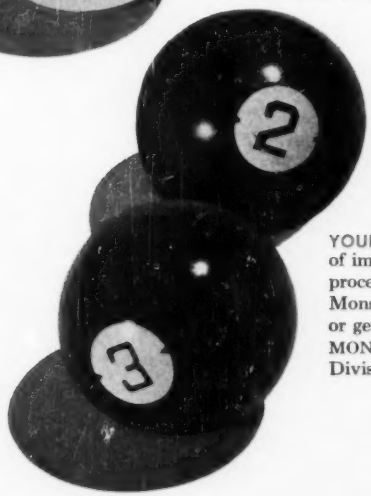
MONSANTO'S FULLY EQUIPPED APPLICATION LABORATORY will work for you without cost or obligation. Write, wire or 'phone and tell us your problem. We will save you initial work by recommending a *proved* formulation, or, Monsanto's technical service staff will work out a tailor-made formulation for you. If necessary, and if you desire it, a specialist will work with you *in your plant*.



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SERVING INDUSTRY . . . WHICH SERVES MANKIND

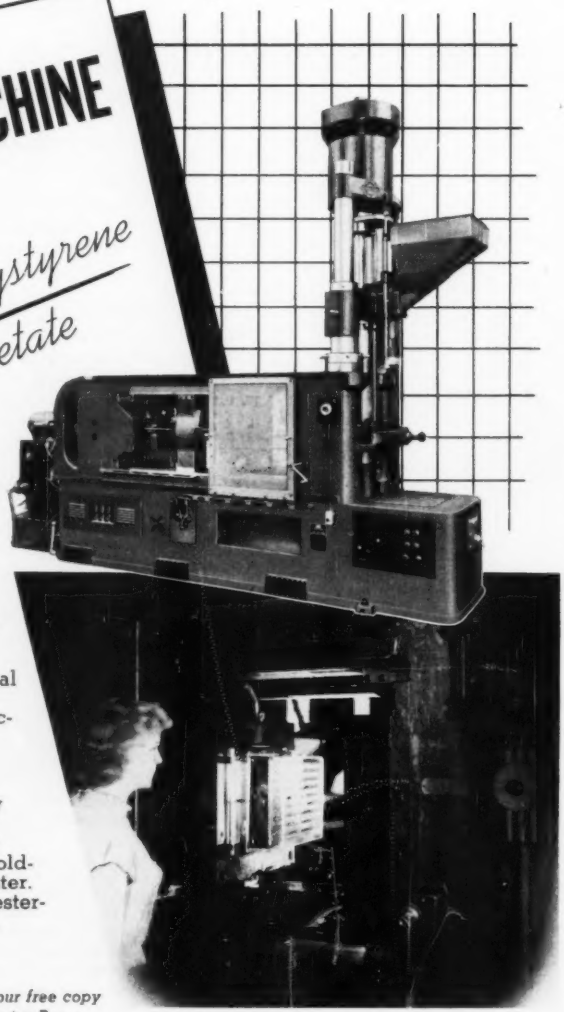
LET'S TALK LESTER TALK

32 OZ. MACHINE

means

32 oz. polystyrene

40 oz. acetate



Yes, in Lester language, the 32 ounce machine means that it is rated in *32 ounces of polystyrene*. By the same token, we say greater die space and mean *28½" between the beams*. The large central die adjusting screw, 3750 extra watts of internal heat in the spreader, the solid frame with beams equivalent to 9" bars, hydraulic ejection—these exclusive Lester features, and more, mean faster, better production of large pieces.

The 30 ounce shot shown here is a Crosley Crisper Pan, being run by the General American Transportation Company in East Chicago, Illinois. It is typical of the fine molding that is being done on the 32 ounce Lester. For complete specifications check with Lester-Phoenix or the representative in your area.

Write for your free copy of the Lester Press

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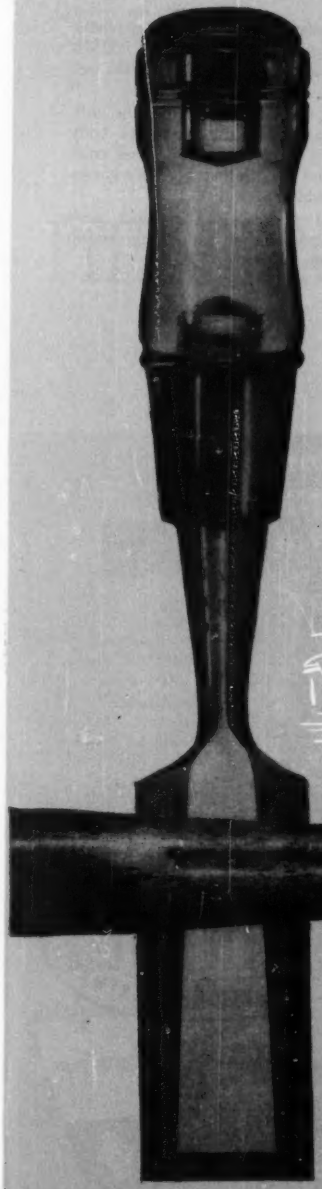

To obtain plastic tool handles and hammer faces of utmost strength and durability, thus maintaining a well-earned reputation for quality, Stanley Tools specifies parts made with ethyl cellulose. This versatile thermoplastic provides unrivaled toughness and dimensional stability over a broad range of temperatures and humidities.

As a result of continuing research, today's formulations of "Hercocel E" (Hercules Ethyl Cellulose Molding Powder) are better than ever before, offering a material of improved appearance and performance. Just as it has in tool handles, ethyl cellulose is setting new standards for *quality in plastics* in a wide variety of applications. Why not call on our technical staff to explain how "Hercocel E" can provide increased product values for you?

HERCULES POWDER COMPANY
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- PX-408 DiIsoOctyl Sebacate
- PX-850 TetraHydroFurfuryl Oleate
- PX-810 TriPhenyl Phosphate
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Check the above list for your needs—then write today for individual bulletins which give full commercial and technical information about each of the Pittsburgh PX Plasticizers.

Plasticizer Division

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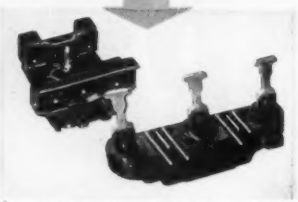
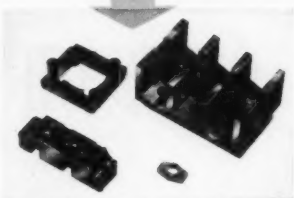
ALLEN BRADLEY... switch-hitters on molding jobs



Stokes 150-ton Plunger Molding Press, and parts (one including inserts) made on this press.



Battery of Stokes Fully Automatic Molding Presses, 15 and 50-ton, and typical parts produced.

When Allen-Bradley of Milwaukee needs parts with adjoining thick and thin sections or parts requiring inserts they use Stokes plunger molding presses.

When they need a volume of smaller parts adapted to automatic production, they switch to fully automatic Stokes machines.

Both these types of Stokes machines have a considerable range of flexibility. You can produce anything on a plunger molding press that you can on a fully automatic but you require a man at each plunger press to load and unload for every cycle. For the parts that require no attention after set-up the fully automatic is ideal . . . one unskilled man can run a dozen or more automatics.

Either of these Stokes machines produces superbly finished quality parts.

Allen-Bradley finds it profitable to have both types. Many manufacturers would profit by the same plan, especially as the Stokes plunger molding press is easily converted to compression molding. Send the coupon to learn the special advantages of switch-hitting in your molding practice.

STOKES MAKES Automatic and Semi-Automatic Molding Presses, Plunger Presses, Closure Presses, Preforming Presses, Industrial Tabletting and Powder Metal Presses, Vacuum and Special Processing Equipment, Water Stills and Special Machinery.

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Write for your copy of our booklet, "Who We Are — What We Do."

Plastics Division

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BY DPi HIGH VACUUM

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High vacuum has become important at both ends of the plastics industry. Besides its role in ornamentation of molded items, high vacuum makes possible flash distillation of plasticizing and stabilizing components of plastics that preserve elasticity and freedom from cracking.

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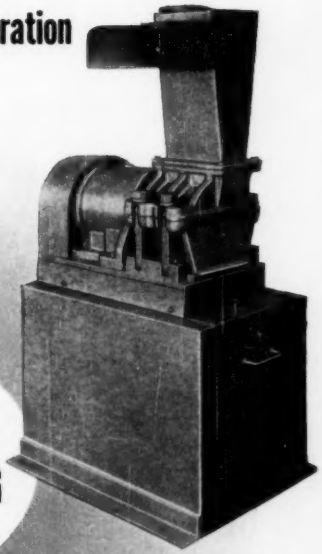

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(Model 1/2 Illustrated)
FOR CENTRAL GRINDING

Used primarily when scrap material is transported to a central area for the granulating operation. Capacity is large in proportion to size of machine. Available in Models 0, 1/2, 1-1/2, and 18.

V-BELT DRIVEN
(Model 1/2 Illustrated)
FOR USE BESIDE EACH INJECTION MOLDING MACHINE

Saves handling costs. Prevents contamination of material. Occupies less floor space. Material container is built-in. Available in Models 0 and 1/2 only.

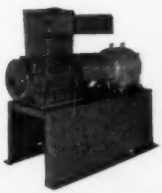
For complete information, request Bulletin 250.

CUMBERLAND

ROTARY CHOPPING MACHINE

Heavy duty, rugged machine. Used for cutting thick vinylite slabs from two roll mills. Also used as large capacity pelletizer. Other applications are described in Bulletin 400.

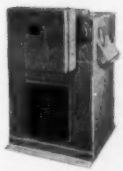
CUMBERLAND



GRANULATING MACHINE MODEL 18

Large capacity. Double hung construction. Easy to inspect, dismantle, and adjust. Further details are in Bulletin 250.

CUMBERLAND



PELLETIZING MACHINE

Smaller, companion model to Rotary Chopper. Designed specifically for use with continuous extruders. Request Bulletin 500.

California Representative:
WEST COAST PLASTICS DISTRIBUTORS, INC.
2325 Jesse Street, Los Angeles 23, Cal.

Let's talk TURKEY

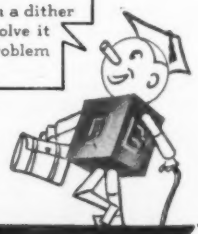
CUBEE wants your business... This advertising which we buy in many trade papers month after month is for one purpose and one purpose only . . . to tell you we want your business.

We can tell at great length of the many facilities we can offer such as designing, die-making, molding, modern production methods and highly trained and experienced craftsmen. Yet it all boils down to suggesting you consult with us early on your plastics problems.

So let's get to the point . . . Let's Talk Turkey. The next time you have a plastics problem, call Cubee. Plastics is his business.

Q-B Says:

"When a plastics problem has you going
And you're really in a dither
There *is* a way to solve it
Simply send your problem hither."



QUINN-BERRY CORP.
2659 West 12th Street
ERIE, PENNSYLVANIA

Quinn-Berry PLASTICS

Branch Offices

MR. HARRY R. BRETHEN
11341 Woodward Avenue
Detroit, Michigan
Townsend 8-2577

PARAGON SALES COMPANY
111 S. 22nd Street
Philadelphia 3, Pennsylvania

Thanks, Emily Post

for those nice words about plastics

"For the first anniversary—colorful, convenient, practical plastics products, along with paper, make the delightfully modern anniversary gift."

What a wonderful opportunity—a golden opportunity for the plastics industry to boost sales of plastics items. We, at Monsanto, think Emily Post's recommendation has such great merchandising possibilities—that we're telling the Saturday Evening Post's 17,000,000 readers about it in a four-color cover advertisement, September 23. A complete promotion kit has been furnished to the thousands of retail stores throughout the country that are tying in with Monsanto to promote "plastics for the first anniversary."

what Emily Post's recommendation means to you

By taking advantage of this wonderful new opportunity to popularize plastics—the whole plastics industry, and particularly proprietary molders, their suppliers and customers, have a year-'round opportunity to win new customers. By aggressively advertising and promoting "plastics for the first anniversary"—and as gifts for all occasions—we can give Mrs. Post's plastics recommendation the impetus that will make it a *more* profitable tradition for us all.

Read Emily Post's recommendation of plastics in Monsanto's September 23 advertisement.

MONSANTO
CHEMICALS—PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND

MONSANTO CHEMICAL COMPANY
Plastics Division, Dept. MPLP 33, Springfield 2, Mass.
Please send me your booklet about Monsanto's merchandising program.

Name & Title _____

Company _____

Address _____

City, Zone, State _____

RAW MATERIAL

The custom molder has long since resigned himself to his allotted position in the plastics industry, tucked cosily behind the eight ball. It does have the doubtful advantage of being shady there. This will not stop him from letting out with occasional cries of pain when someone rolls the aforesaid eight ball over on his toes without warning. He doesn't like to be disturbed at his efforts to make a meal from the incautious items which flit in his direction.

The ebb and flow of plastics raw materials are a matter of real concern to him. At times this concern rises to wonderment.

Case history No. 1—Phenolics . . . During the war, many molders had to shift their sources of supply from the accustomed channels. After the war, phenolics were scarce and went on allotment. Some makers set the allotment on pre-war purchases, some on war purchases. Result—headaches for the unlucky ones.

Case history No. 2—Polyethylene . . . This was the darling of radar. When wifely intuition proved scientifically accurate in plotting the whereabouts of her wandering spouse, it was discovered that the demand for this plastic was non-existent. So the R.M.M. (Raw Material Makers) called on the molders to find uses. That takes time, so the R.M.M. were probing too. Result—1948, supply plentiful; 1949, on allocation; 1950 (first quarter), supply plentiful; 1950 (second quarter), on allocation.

Case history No. 3—Polystyrene . . . This one really speeds up the confusion. January 1950, overnight delivery; April 1950, pending price war; May 1950, perhaps 60 days.

All the poor custom molder has to do is convince his customers that they should order molded parts three months ahead and that their competitors are, to put it mildly, exaggerating if they claim to have an inside track and can get material any time they order it.

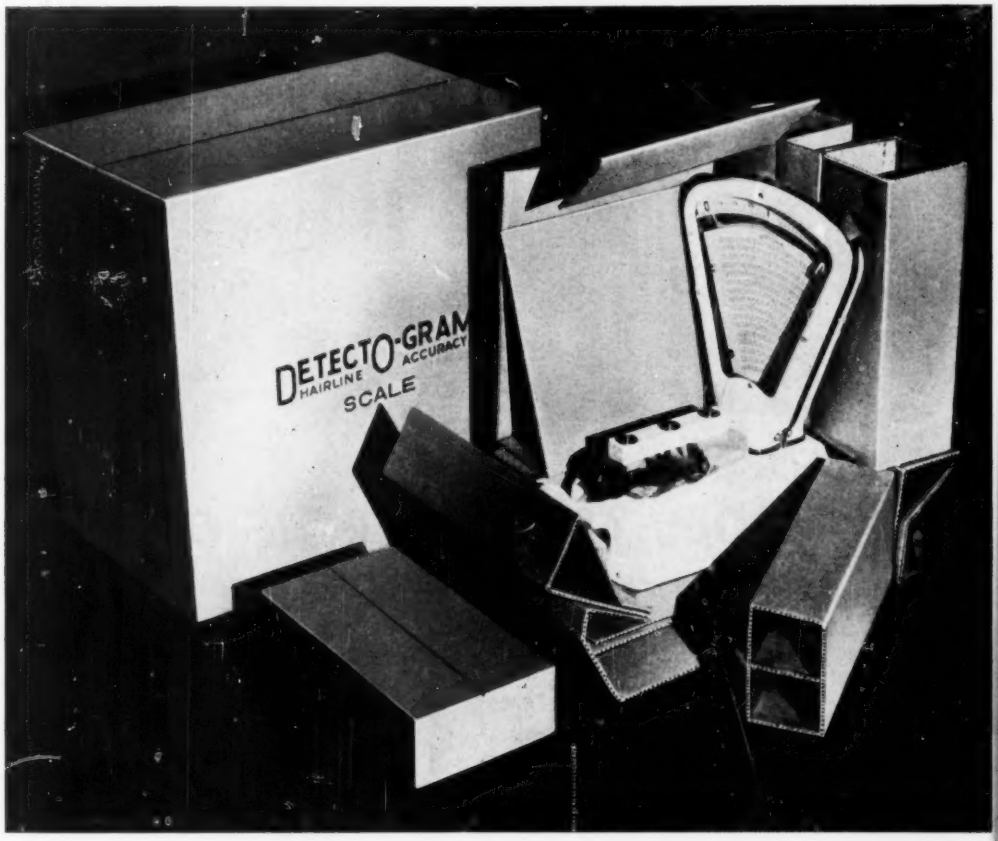
We are used to our position relative to the aforesaid eight ball, but we get confused when someone pushes it over on us without fair warning.

GEORGE K. SCRIBNER, PRESIDENT

BOONTON MOLDING CO.

BOONTON, NEW JERSEY • BOONTON 8-2020

Creative Package Engineering



this corrugated "shock-proof" shipping box

Supports its contents . . . excludes foreign materials . . . resists abrasion . . . cushions delicate assemblies . . . braces . . . provides clearance for all parts . . . shields surface from scratching, chipping . . . pads corners . . . protects product throughout. For perfect protection for any product at lowest possible cost consult Hinde & Dauch, Executive Offices, 5006 Decatur St., Sandusky, Ohio.

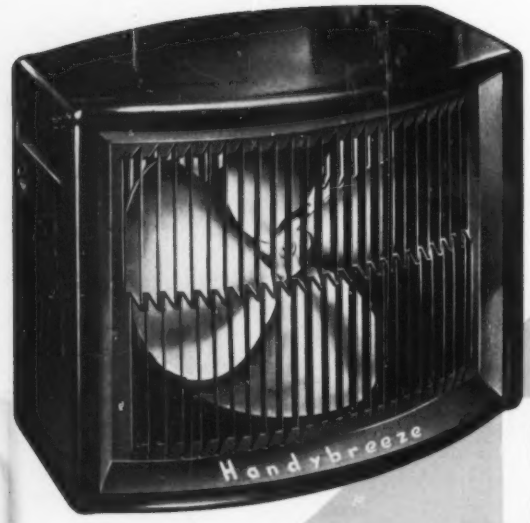
H&D®

HINDE & DAUCH

Authority on Packaging

"Behind The Scenes at the Package Laboratory." Discover how packaging bottlenecks are broken, waste eliminated, costs cut, sales stepped up through intelligent packaging. Write for your copy.

FACTORIES AND SALES OFFICES IN: Baltimore • Buffalo • Chicago • Cleveland • Detroit • Gloucester, N. J. • Hoboken, N. J. • Kansas City, Kan. • Lenoir, N. C. • Richmond, Va. • Sandusky, Ohio St. Louis • Watertown, Mass. SALES OFFICES IN: Akron • Battle Creek • Cincinnati • Columbus • Denver • Erie, Pa. • Fairfield, Conn. • Findlay, Ohio • Greensboro, N. C. • Indianapolis • Miami Minneapolis • Olean, N. Y. • Omaha • Philadelphia • Pittsburgh • Reading, Pa. • Roanoke, Va. • Rochester • Toledo • Worcester, Mass. IN CANADA, HINDE & DAUCH PAPER CO. OF CANADA, LTD. Toronto • Montreal • Chatham • Calgary • Halifax • Hamilton • Kitchener • London • Peterborough • Quebec • Regina • St. John, N. B. • St. John's, Newfoundland • Vancouver • Winnipeg



PRODUCES ANOTHER BIG ONE!

Large Fan Housing Reduces Costs—SPEEDS ASSEMBLY

PLASTIC MOLDERS, INC. (CHICAGO)

For the first time, Chicago Electric Mfg. Co. can house their large 16" Handybreeze Cabinet Fan in plastic. And all as a result of Plastic Molders, Inc. (Chicago) knowing how to "handle the big ones."

The cabinet is molded of phenolic in a brown mottled walnut finish. Added strength, toughness and durability have been added to this fan with its plastic housing. It's also lighter in weight and can be carried with two recessed handles molded right in the housing.

The two moldings that make up the case weigh a total of 18 lbs.

This large job is just one of the reasons why more and more manufacturers of air conditioning and heating equipment are turning to Plastic Molders, Inc., for the answer to their plastic parts problems.

Out staff of engineers here at Plastic Molders, Inc. (Chicago) is ready to go to work for you—give us a call —write, wire or phone us about your next compression or injection molding job.

HERE'S EQUIPMENT TO DO YOUR JOB TOO!

Modern tool room and die shop.

Compression presses from 100 tons to 750 tons.

Transfer presses from 100 tons to 400 tons.

Injection presses from 8 oz. to 32 oz.

Fabrication, assembly and painting of all types of plastics.

"LARGE OR SMALL . . . PMI MAKES THEM ALL"

PHONE CHICAGO ***PAlisade 5-6750***
Write R. K. Kewley, Sales Manager
Representatives in Principle Cities

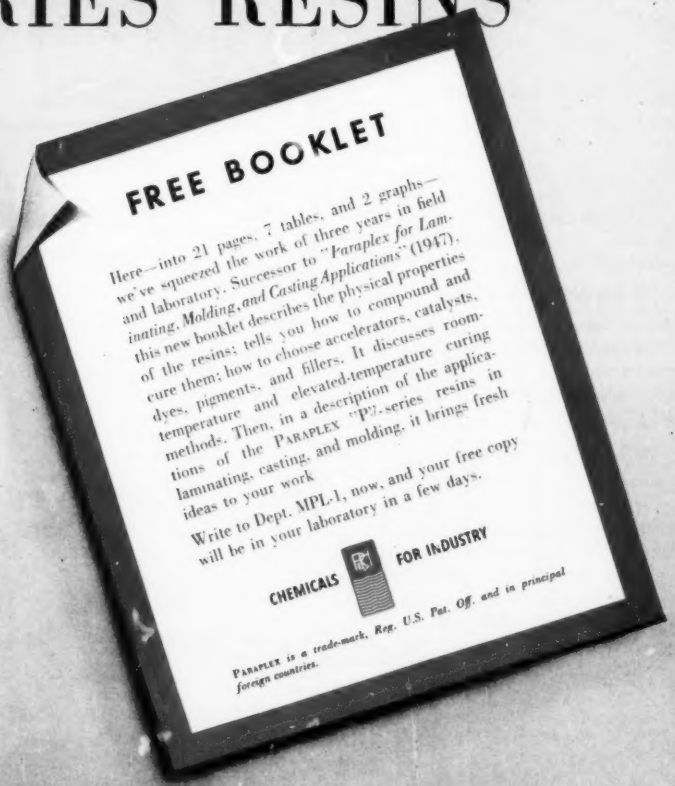
PLASTIC MOLDERS, INC.
OF CHICAGO
Compression and Injection Molders
3670 Milwaukee Ave.—Chicago 41, Illinois

APPROVED MOLDED PRODUCTS

MOLDINGS UP TO 25 LBS.

The

PARAPLEX "P" SERIES RESINS


FREE BOOKLET
Here—into 21 pages, 7 tables, and 2 graphs—we've squeezed the work of three years in field and laboratory. Successor to "*Paraplex for Laminating, Molding, and Casting Applications*" (1947), this new booklet describes the physical properties of the resins; tells you how to compound and cure them; how to choose accelerators, catalysts, dyes, pigments, and fillers. It discusses room-temperature and elevated-temperature curing methods. Then, in a description of the applications of the PARAPLEX "P"-series resins in laminating, casting, and molding, it brings fresh ideas to your work.
Write to Dept. MPL-1, now, and your free copy will be in your laboratory in a few days.
CHEMICALS
FOR INDUSTRY
PARAPLEX *is a trade-mark, Reg. U.S. Pat. Off. and in principal foreign countries.*

ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

WASHINGTON SQUARE PHILADELPHIA 5, PA.

Now you can cut losses and maintenance costs—with TIMKEN® bearing equipped calenders

When your calender rolls are precision-mounted on Timken® bearings, you get consistent gage in your plastic sheets. As a result, losses due to rejects and too-thick sheets are sharply cut.

EXTREME PRECISION

Timken tapered roller bearings can be adjusted very precisely at installation to allow for roll expansion caused by heat. Rolls are more rigid. Vertical roll movement is held to a minimum. Calender precision is maintained.

MAINTENANCE CUT

Timken bearings give you still greater savings through lower maintenance costs. Lubrication takes fewer man-hours. Wear on moving parts is reduced.

UNIQUE DESIGN

Thanks to the tapered design and line contact of Timken bearings, they take the heaviest radial, thrust and combination loads. They offer special advantages in calenders, mills, refiners and banbury mixers. For details write The Timken Roller Bearing Company, Canton 6, Ohio. Cable address: "TIMROSCO".

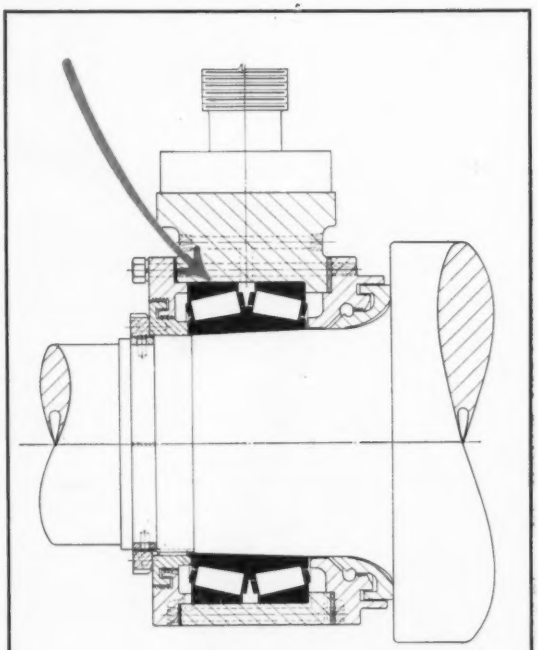
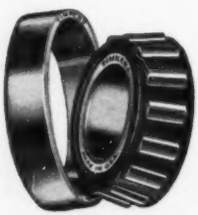


Diagram shows how calender rolls are mounted on Timken bearings

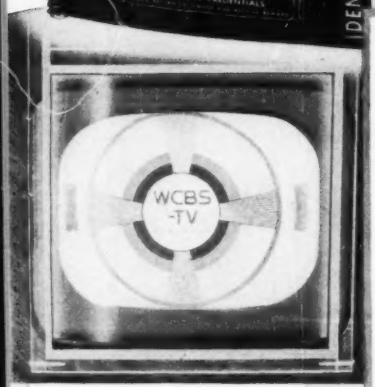
TIMKEN

TRADE MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ⬭ THE TIMKEN TAPERED ROLLER ⬭ BEARING TAKES RADIAL ⬯ AND THRUST ←⬯→ LOADS OR ANY COMBINATION ←✳→



Want Low Cost
TRANSPARENCY?
SEE THE NEW IMPROVED
LUMARITH*
ACETATE SHEET

Look into the cost and production advantages of the new type Lumarith acetate sheet—the sheet that sells for substantially less. You can get Lumarith in continuous lengths in several standard widths. You save with less blanking scrap and faster production.

HERE ARE LUMARITH FEATURES YOU SHOULD KNOW ABOUT:

- ***Low cost*** *substantially less than comparable material*
- ***Wider range*** *of sizes, gauges, colors*
- ***Large inventory*** *of stock items*
- ***Better surface brilliance*** *and color permanence*
- ***Uniform gauge***
- ***Non-flammable*** *safe storage and handling*
- ***3% more sheet area per pound*** *than nitrate*
- ***Easy to fabricate*** *blank, bead, draw, cement*
- ***Perfect printing surface***
- ***Good electrical properties***

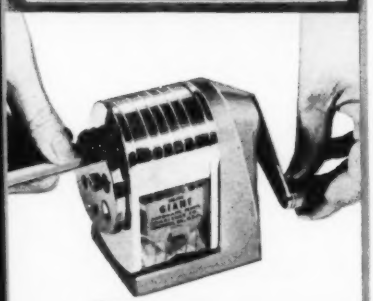
Before you buy any other material, see your Celanese representative or your nearest Lumarith jobber. He will give you more facts about Lumarith . . . answer your specific questions, and quote prices that will mean real savings. Celanese Corporation of America, Plastics Division, Dept. 101-I, 180 Madison Avenue, New York 16, N. Y. In Canada, Canadian Cellulose Products Ltd., Montreal and Toronto.

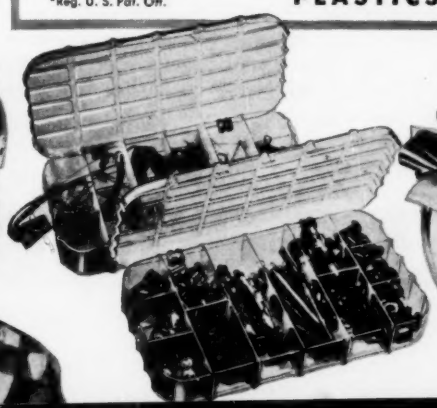
Celanese* **PLASTICS**

*Reg. U. S. Pat. Off.

Clear and colored transparents for side curtains, safety and sport goggles, machine guards . . . excellent transparency . . . clear-through colors (not coated).

Lumarith acetate sheet is ideal for advertising displays and transparent packaging. Newly developed inks permit plate polishing after printing . . . excellent dimensional stability . . . fluorescent colors for special effects.





How to make PLANNED assembly savings PAY OFF

AVOIDS 17 TAPPING OPERATIONS
Casco Products Corp. product engineers looked beyond smart appearance and trouble-free operation in planning the Casco Steam and Dry Iron. They recognized the economy and extra security of Self-tapping Screws for 17 fastenings. They also specified "Parker-Kalon" to make sure the planned savings would not be lost by screw failure and spoiled parts in production assembly. Nine P-K Type F Screws fasten internal parts to die-cast aluminum. Two P-K Type F and six P-K Type U Screws fasten external parts to the Bakelite handle. All screws are power driven. Type U Screws are driven three at a time in a power press.

Manufacturers of America's best-known products recognize that the actual cost of fasteners depends, never on price, *always* on performance. They know it's common sense to get the best Self-tapping Screws money can buy.

Don't let screw failure cancel savings

If you use the wrong type screws, if screws run offsize, break, or otherwise fail, all your planned savings will be lost in slow-downs and scrapped parts. Parker-Kalon, *originators* of Self-tapping Screws, learned long ago how to maintain the uniform quality, in every screw, that keeps assembly humming.

Let P-K* fit the fastener to the job

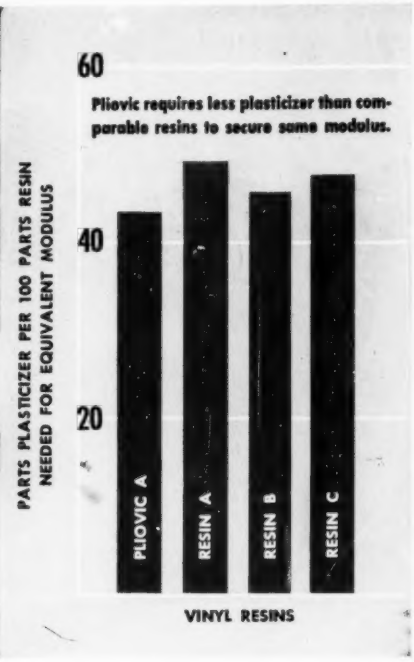
A P-K Assembly Engineer will help you fit the right fastener to your needs, not your needs to a certain type—because P-K make a complete line. Find out why so many thousands of leading manufacturers say—"If it's P-K . . . it's O.K." Parker-Kalon Corporation, 200 Varick St., New York 14, N. Y. Sold everywhere through Accredited Distributors.

*TRADE MARKS REG. U.S. PAT. OFF.

P-K TRADE MARK

The Original
PARKER-KALON* SELF-TAPPING SCREWS

A TYPE AND SIZE FOR EVERY METAL AND PLASTIC ASSEMBLY



For better Vinyls with less plasticizer

use PLIOVIC A

YOU can reduce your plasticizer requirements—cut your fabricating costs — improve your production—all without changing the present physical properties of your vinyls—when you use **Pliovic**—Goodyear's new and different vinyl chloride-type copolymer.

Pliovic needs from 5% to 10% less costly plasticizer than comparable copolymers. Reason is the more efficient internal plasticizing action of the second monomer contained in **Pliovic.**

Because of this efficient internal plasticization and lower-fusing temperature, **Pliovic** is unusually processable. It can be milled, Banbury mixed, calendered or extruded at lower temperatures than copolymers of comparable molecular weight.

Available in Two Types

Pliovic A may be used alone or in combination with other vinyl resins—has high strength, excellent resistance to flex-fatigue, good age and light stability and good chemical resistance. It has been "use proved" in calendered films and flooring and extruded hose and tubing.

Pliovic AO—for use in organosols—can be compounded to give organosols of high strength, excellent clarity and lower heat-sealing or fusing requirements.

For full details on these laboratory and use-proved **Pliovic** vinyl chloride-type copolymers, write to: **GOODYEAR, CHEMICAL DIVISION, AKRON 16, OHIO.** Ohio.

USE PROVED *Products*

GOODYEAR

Pliovic—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

The NEW way to BETTER LABELING by CHICAGO SHOW PRINTING COMPANY

This MYSTIK Label identifies and sells, and gives important instructions to the consumer. It's beautifully printed in three colors and acetate laminated, for a striking, rich-looking label.

This is the permanent trade mark label on the popular Burgess Vibra Sprayer. Printed in sparkling colors and laminated. Self-Stik MYSTIK means fast production-line application and lifetime beauty.

Quality products deserve the quality label . . . MYSTIK. This rich-looking label is easily applied to THERMOS Vacuum Ware, it really stays put, but can be removed as needed.

This MYSTIK Self-Stik Label does a three-way job at the point-of-sale . . . it informs, it sells, it identifies. Because it's a MYSTIK Label, it goes on fast and stays put . . . won't curl or fall off.

Let us suggest a MYSTIK Label for your product—for identification, for point-of-sale selling or instructions. Self-Stik MYSTIK LABELS speed hand labeling, solve your hard-to-label problems. They stay put, but if necessary are removable without a trace. They can be printed beautifully in colors, embossed, die-cut to all shapes and sizes. Write for samples and free booklet.

Mystik Self-Stik LABELS

CHICAGO SHOW PRINTING COMPANY • 2669 NORTH KILDARE • CHICAGO 39, ILLINOIS • OFFICES IN PRINCIPAL CITIES IN NEW YORK 1775 BROADWAY

Baby Book Bank, molded of acetate for Banthrico, Chicago

Something to Bank on

This bank can teach you a profitable lesson in plastics. While it was made to teach a child one of the dependable virtues, it also tells you about one of the most dependable virtues of the Elmer E. Mills Corporation . . . our imagineering* versatility. It is proof of the painstaking care and attention we give to injection molding and extrusion jobs from the simple to the highly complex.

You can always bank on this fact: A product molded by the Elmer E. Mills Corporation will be a brilliant example of the plastic molder's craftsmanship and scientific ingenuity.

Bring your next molding job to us. You will be more than pleased with the result.

Imagination and Engineering Skill

Write on your letterhead for the new Injection Molded and Extruded Plastics Catalog. Or, for detailed information about MILLS-PLASTIC*, pipe, tubing and fittings, write for circulars containing data and illustrations.

*Trademark Reg.

ELMER E. MILLS CORPORATION

INJECTION MOLDERS and EXTRUDERS of: Tenite, Lumarith, Plastacele, Fibestos, Lucite, Plexiglas, Nylon, Polystyrene, Styron, Loalin, Vinylite, Geon, Flexene, Polyethylene, Cerex, Forticel, Ethocel*, Saran, and other Thermoplastic Materials.

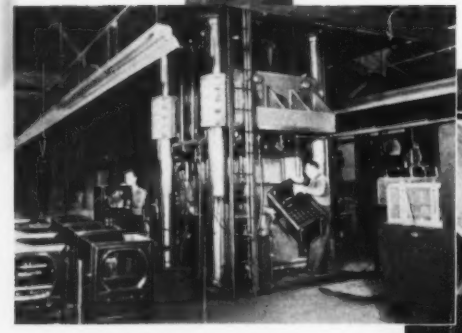
2930 NORTH ASHLAND AVENUE • CHICAGO 13, ILLINOIS

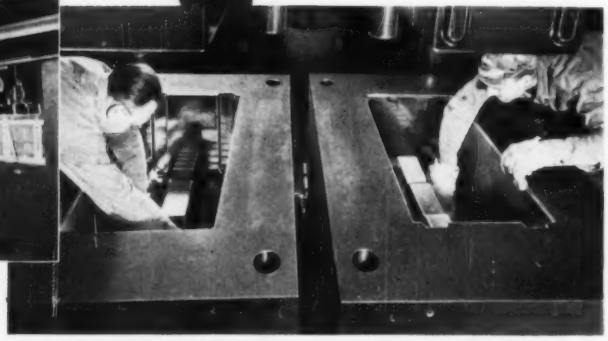
IT TAKES *Skill* TO HANDLE THE BIG ONES

Giant size plastic moldings call for giant press capacity...of course. But it takes more than a big squeeze to turn out huge castings in production quantities. Increased size poses new problems in mold design and construction. New techniques are needed to control the flow of the massive "charge" ...for thorough curing and flawless surface finish.

In pacing the advance to ever larger plastic castings, **MPc** has acquired a matchless fund of specialized experience. This priceless "know-how" is yours to use in the design and production of your large plastic parts.

Address Molded Products Corporation, 4535 W. Harrison St., Chicago 24, Illinois.





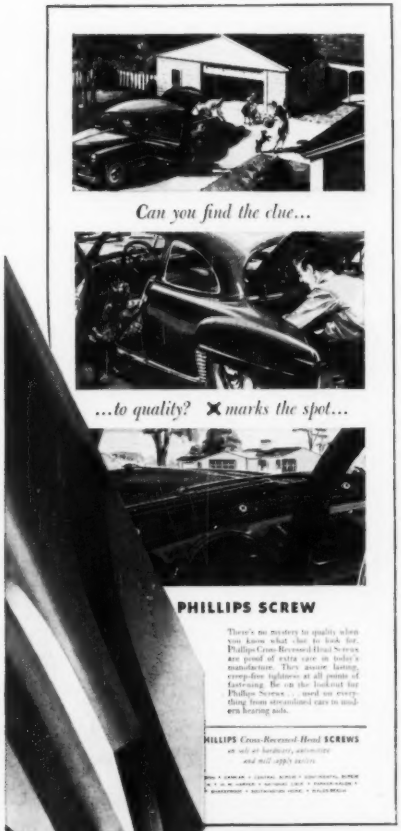
At **MPc**, huge twin cavities produce two 40 lb. television cabinets every five minutes...molded for Admiral Corp.

PLASTICS DIVISION

MOLDED MPc PRODUCTS

CORPORATION

You benefit from this dramatic new campaign in the


Can you find the clue...
...to quality? ✕ marks the spot...
PHILLIPS SCREW
There's no mystery to quality when you know what clue to look for. Phillips Cross-Recessed-Head Screws are proof of extra care in today's manufacture. They assure lasting, creep-free tightness at all points of fastening. Be on the look-out for Phillips Screws . . . used on everything from streamlined cars to modern hearing aids.
PHILLIPS Cross-Recessed-Head SCREWS

THE SATURDAY EVENING POST

Public urged to look for Phillips Screws —the clue to quality . . . found on all modern products

BEGINNING AUGUST 26, a striking campaign on Phillips Screws will be launched in The Saturday Evening Post. Aimed at the general public, it will tell 14 million readers to look for the mark of extra quality in well-built products *. . . the identifying X that appears on the head of Phillips Cross-Recessed-Head Screws.*

Whether you use Phillips wood screws, machine screws or tapping screws, you benefit from this forceful quality story. Remember, too, when you use Phillips Screws you build a better product . . . save time, money, work-hours.

Be sure to put the "clue" to extra quality in your product.

PHILLIPS *Cross-Recessed-Head* SCREWS

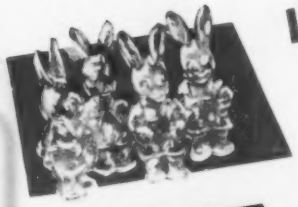
✕ *marks the spot . . . the mark of extra quality*

AMERICAN SCREW CO. • THE BLAKE & JOHNSON CO. • CAMCAR SCREW & MFG. CORP.
CENTRAL SCREW CO. • CONTINENTAL SCREW CO. • ELCO TOOL & SCREW CORP.
GREAT LAKES SCREW CORP. • THE H. M. HARPER CO. • NATIONAL LOCK CO. • PARKER-KALON CORP.
PHEOLL MANUFACTURING CO. • ROCKFORD SCREW PRODUCTS CO. • SCOVILL MANUFACTURING CO.
SHAKEPROOF INC. • THE SOUTHINGTON HDWE. MFG. CO. • WALES-BEECH CORP.

THE FASTENERS OF TODAY . . . AND OF THE FUTURE

Compare!

Note the Concrete Results of Greater Plasticizing Capacity*



17 Seconds vs. 27 Seconds!

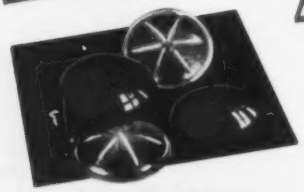
A 2-piece rabbit on an 8-cavity mold in almost half the cycle time.

280 Shots vs. 180 Shots!

This picnic plate in a single cavity mold with a third more shots per hour.

27 Seconds vs. 32 Seconds!

A considerable faster cycle on this 2 cavity box mold.



40 Seconds vs. 52 Seconds!

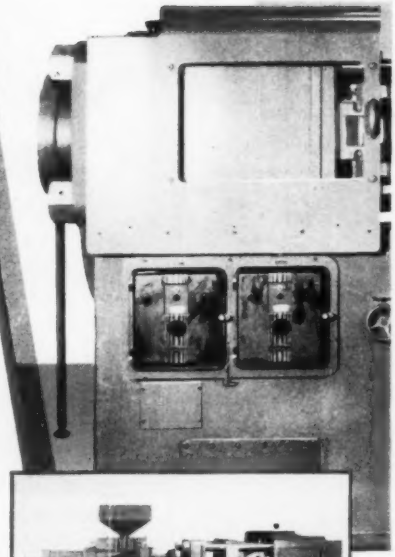
8½ ounces of Styrene, or 9.7 ounces of Butyrate—4 cavity mold for the road marker.

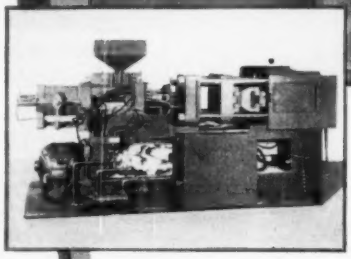
30 Seconds with No Flash!

8" woman's dressing comb 7.3 ounces in Styrene, 100% filling without flash.

*Production figures are based upon actual runs on the new-design F-L 5C-8 as compared with other equivalent size injection molding machines.

Setting the



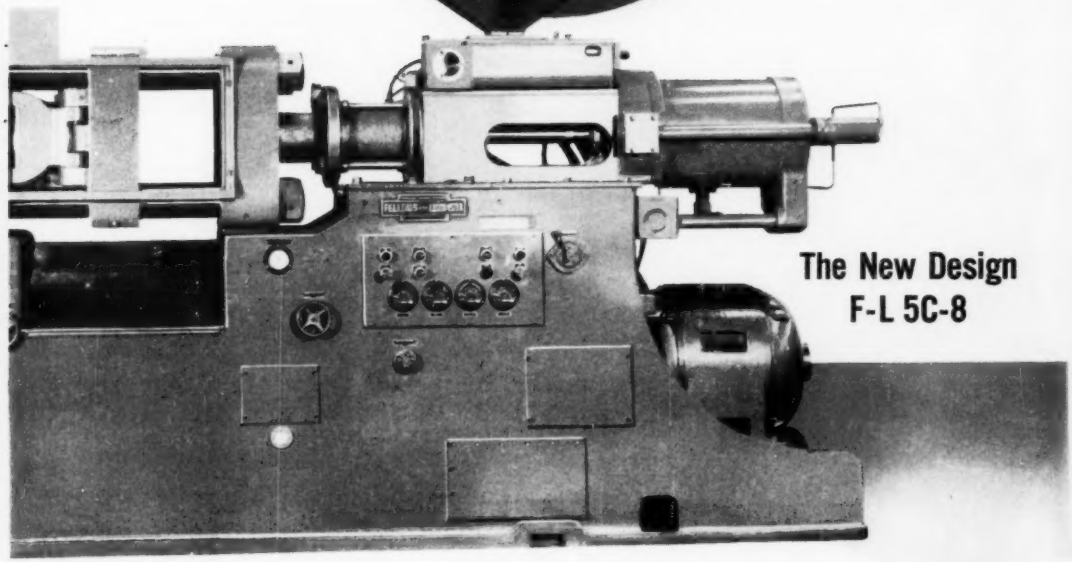


Note the simple arrangement and open accessibility of the hydraulic system and controls.

THE FELLOWS GEAR SHAPER CO., Plastics Machine Division

Head Office and Export Dept., Springfield, Vermont. Branch Offices: 616 Fisher Bldg., Detroit 2

Pace in 8 ounce shots too!



The New Design
F-L 5C-8

PRODUCTION MOLDERS will profit by examining the advanced features of the new Fellows Leominster 8-ounce machine. Here is production capacity and ease of operation never before available in a machine of this class.

MORE PLASTICIZING CAPACITY
—a fast-heat 'Speed-Flo' Cylinder boosts output to 80 pounds per hour . . . at the same time incorporating all the advantages of the F-L exclusive cylinder design and 'Taper-Tite' Separator. Also operates without excessive temperature, for faster cooling and less distortion of finished pieces.

MORE CYCLES PER HOUR
—up to 340 (dry-run) through the rapid advance injection plunger. Consider also the other Fellows design exclusive central screw adjustment for quick mold set-up, Continuous-Pressure-Line toggle action for minimizing flash.

Any molder seeking maximum output and a sound machine investment will want to know all about the new F-L 5C-8. Arrangements can be made to see this 'pace-setter' in operation. Write the Fellows office nearest you for further details.

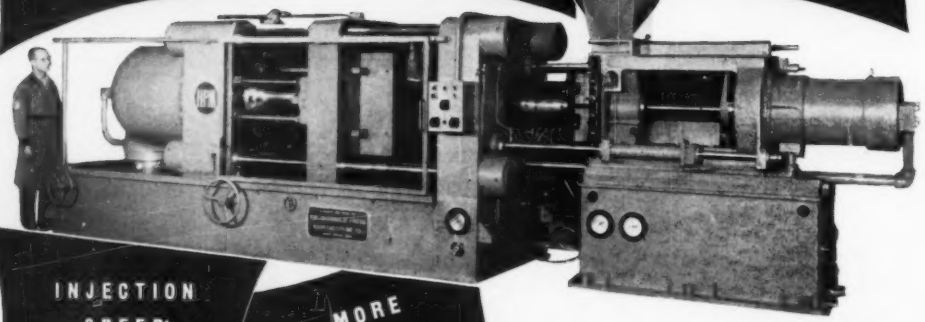
Fellows
LEOMINSTER
injection molding equipment

• 640 West Town Office Bldg., Chicago 12 • 2206 Empire State Bldg., New York 1 • New England Distributor: Leominster Tool Co., Leominster, Mass.

ALL ELECTRICAL CONTROL EQUIPMENT IN PANEL CABINET

EASY ACCESSIBILITY TO HYDRAULIC PUMPS AND VALVES

LOW CENTER LINE NO PIT OR PLATFORM NEEDED



INJECTION SPEED DOUBLED

50% MORE PLASTICIZING CAPACITY

DESIGNED FOR EASY CONVERSION TO 200 OZ. PRE-PLASTICIZING

H-P-M's NEW "60 OZ." INJECTION MOLDING MACHINE

THE LATEST "PROFIT-MAKER" FROM H-P-M, DESIGNED FOR TODAY'S MAXIMUM CAPACITIES

H-P-M's "60A" is important news to every molder. Built-into this outstanding machine are features which provide easy conversion to larger injection capacities . . . up to 200 ounces! The H-P-M All-Hydraulic Mold Clamp is a distinct and separate unit . . . it's versatile . . . no need to buy a new mold clamp if you want bigger shot capacity later . . . just buy H-P-M's 200 ounce pre-plasticizing conversion unit when you're ready. Think what this means in reduced equipment investment! In addition, H-P-M's famous proven design, fast mold cycle, quick mold set-up, versatile application, dependable service are part and parcel of this new H-P-M machine.

Insure your position for new and future molding business by checking into the H-P-M "60A" today—it's the profitable thing to do.

Write for complete specifications.

H-P-M STOCK SIZES — 9, 16, 32, 60 & 200 oz. CAPACITIES

The H-P-M "60A" electrical control equipment including relays, timers, pyrometers are completely housed, and easily serviced in this panel cabinet.

Extra long torpedo for increased plasticizing capacity.

SPECIFICATIONS

H-P-M MODEL 1000-H-60A

Injection capacity (oz.)	60
Mold Clamp (tons)	1000
Mold space	40"x60"
Daylight	54"
Clamp travel	36"
Injection pressure (psi)	20,000
Plasticizing capacity (lbs./hr.)	300
Heat cylinder (K.W.)	48
Motor H.P.	100
Weight (lbs.)	105,000

All Material ratings based upon molding cellulose acetate.

THE HYDRAULIC PRESS HPM MANUFACTURING COMPANY

1010 Marion Road Mount Gilead, Ohio U. S. A.

HEYDEN

The Sign of Quality and Reliability!

FORMALDEHYDE

In tank cars or in bottles, Heyden Formaldehyde is a clear, colorless solution free of impurities which might cause residual foreign odor or discoloration.

Produced under rigid laboratory control from pure raw materials, it assures uniform yields and high quality. Available as Formaldehyde Solution U.S.P. or as Methanol-free Formaldehyde, it assays not less than 37% by weight.

Shipped in tank cars, tank trucks, drums, carboys and bottles.

H-C-H H-C-H

PARAFORMALDEHYDE

This alternative source of methylene linkages is equal to Heyden Formaldehyde in purity and uniformity.

Powder, Flo Granules and Granules • Fiber Drums: 250, 100, 50 and 25 lbs.

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HEXAMETHYLENETETRAMINE

U.S.P. (Methenamine) Granular and Powder • Fiber Drums: 100, 50 and 25 lbs.

Technical Granular and Powder.

Barrels: 200 and 150 lbs. • Fiber Drums: 100, 50 and 25 lbs.

H-C-H H-C-H H-C-H H-C-H

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CREATIVE CUSTOM MOLDING

The above plaque, designed for HUDSON MOTOR CAR COMPANY by CAPPEL, MAC DONALD & COMPANY of Dayton, Ohio represents an unusual example of CRUVER'S versatility in the custom molding field.

The Hudson seal, beautifully reproduced in acrylic and decorated in red, white and 24-carat gold, is mounted on a wood plaque. The emblem is produced by injection molding from a single cavity die and finished by CRUVER'S "Bas-Releef" Process.

CRUVER

MANUFACTURING CO.

2460 W. JACKSON BLVD., CHICAGO 12, ILL.

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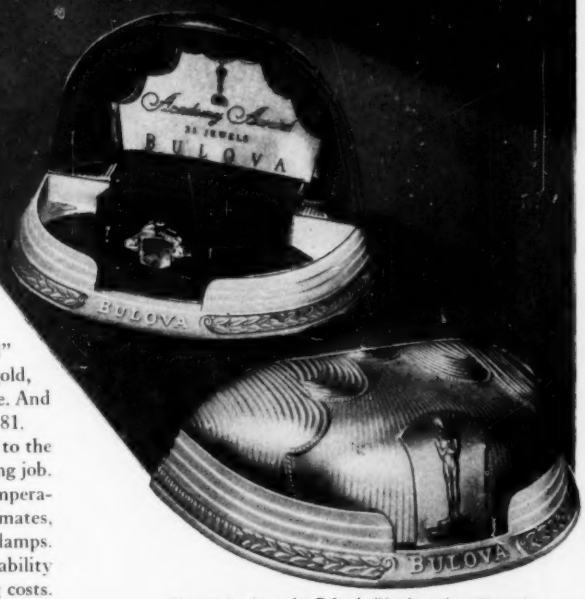
PERFECT SETTING FOR BULOVA'S "Academy Award"



Presentation boxes for Bulova's "Academy Award" watches are molded from Koppers Polystyrene 81. Designer and manufacturer: Arrow Manufacturing Company, Inc., West New York, N. J.

MOLDED FROM KOPPERS POLYSTYRENE 81

BULOVA presents its new "Academy Award" watches in a glamorous setting—ivory and gold, velvet-lined boxes, in the form of a miniature stage. And the boxes are molded from Koppers Polystyrene 81.

Practical considerations, along with beauty, led to the selection of Koppers Polystyrene 81 for this molding job. For Polystyrene 81's improved heat-distortion temperature range gives the box greater stability in hot climates, in unventilated show windows, under batteries of lamps.

Koppers Polystyrene gives fast and easy moldability with minimum rejects, resulting in lower molding costs. Polystyrene's light weight gives more pieces per pound, reducing material costs.

The unique properties of Koppers Polystyrene have made many products better and many better products possible. Investigate it in connection with your product by mailing the coupon for your copy of "Koppers 1950 Polystyrenes."

Bulova's "Fifth Avenue" also has a distinctive box molded from Koppers Polystyrene. It, too, was designed and manufactured by Arrow Manufacturing Company, Inc.

KOPPERS POLYSTYRENE gives you all these advantages

- Low cost
- Light weight—more pieces per pound
- Excellent dimensional stability
- Excellent electrical properties
- Choice of heat-distortion temperature ranges
- Good chemical and moisture resistance
- Tasteless and odorless
- Unlimited color range

Koppers Company, Inc.
Chemical Division, Dept. MP-9
Pittsburgh 19, Pa.

Please send me your booklet on Koppers 1950 Polystyrenes.

Name.....

Company.....

Address.....

City.....State.....

Koppers Perfected Plastics

KOPPERS COMPANY, INC.
Chemical Division Pittsburgh 19, Pa.
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keep them visible with Titanox

"Keeping your eye on the ball" is a cinch when the ball is easily seen. TITANOX pigments make all types highly visible – whether they are billiard, bowling or ping-pong balls; whether made of cellulose, phenol, vinyl, polystyrene or acrylic plastics.

For white and light tinted stocks, lightly loaded, TITANOX-RA is universally applicable. It provides maximum whiteness and brightness and affords any desired degree of opacity. For heavily loaded stocks where the exceptionally high opacity of the "pure" titanium dioxide is not needed, TITANOX-RCHT is preferred.

Our Technical Service Department is always available to help you with your pigmentation problems on plastics. Write us today for any needed information. Titanium Pigment Corporation, 111 Broadway, New York 6, N. Y.; 104 South Michigan Avenue, Chicago 3, Ill.; 2600 South Eastern Avenue, Los Angeles 22, Calif. Branches in all other principal cities.

8055

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the brightest name in pigments

TITANIUM PIGMENT CORPORATION

Subsidiary of NATIONAL LEAD COMPANY

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HOLD IT! Before

YOU SIGN THAT CONTRACT!

No matter what you're about to make or let out for production . . . as long as you haven't ALREADY irrevocably committed yourself . . . CHECK WITH PYRO!

Benefit by the Pyro services, among which CONSULTATION is our "big deal." We absolutely will NOT permit your product to be designed poorly or non-functionally; to use a plastic if another material serves better; to use the WRONG plastic.

Very consciously, very confidently . . . "we invite the challenge of your problems!" You canNOT lose if you pause before the dotted line . . .

. . . and wire, call or cable Pyro!

CONSULTATION
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b) MERCHANDISING
c) PACKAGING
d) PREMIUMS

PRODUCT CREATION and DESIGN

ENGINEERING, RESEARCH and DEVELOPMENT

MOLDING

ASSEMBLY

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Pyro PLASTICS CORPORATION
UNION, NEW JERSEY

COLDER COLD

NEW 1950 **WESTINGHOUSE** REFRIGERATORS DEPEND ON SPECIAL **BRIDGEPORT MOULDED** BAFFLES AND BREAKER STRIPS FOR IMPROVED COLD CONTROL

The last word in modern home refrigeration is truly "Westinghouse". New design plus improvements throughout results in the amazing new automatic Hold-Cold control that maintains colder cold in the freezers and steady temperatures in the food compartments.

One of the secrets behind this performance is special application of plastics Bridgeport Moulded contributes to the success story by supplying Westinghouse with a special polystyrene baffle plate that helps control the all-important flow of cold air. The smart good looks of the new models are enhanced by the glossy breaker strip shown in illustration above.

These parts are injection molded at Bridgeport in extra-large capacity molding presses. Behind their success stand the years of experience gained in making highly specialized plastic parts for all phases of American industry. Perhaps we can help *you* make a better product. Write today to . . .

BRIDGEPORT MOULDED PRODUCTS, INCORPORATED

BOX 3276-O BARNUM STATION BRIDGEPORT 5, CONNECTICUT

MORE *than ever...*

plastic SCRAP *is not* WASTE!

Gering will buy your thermoplastic scrap, obsolete molding powders, rejects in any form . . . will reclaim and rejuvenate this valuable "scrap" into perfectly good molding powders . . . will sell you good reconditioned molding powders: Polystyrene, Cellulose Acetate, Ethyl Cellulose, Polyethylene, Butyrate, Vinyl, Acrylic.

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Our Technical Service Department is at your service at all times.

Products Inc.

KENILWORTH, N. J.

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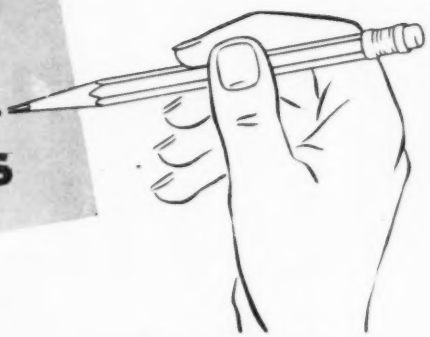
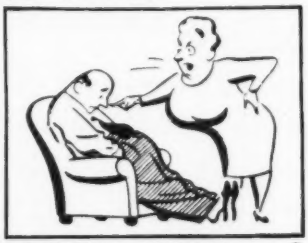
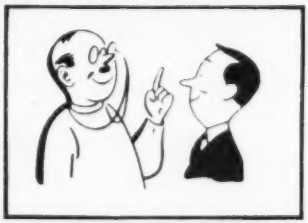
FURFURAL *IMPROVES* PHENOLIC RESINS



LONG FLOW—



COMPLETE CURE—



EXCELLENT FINISH

Molding powders made with furfural-phenol resins give you the advantage of long flow coupled with quick and complete setting at curing temperatures. The long flow is especially helpful to you — the molder — in forming deep draw pieces. These resins maintain their flow properties at temperatures just above those required to induce plasticity then convert rapidly when final temperature is reached.

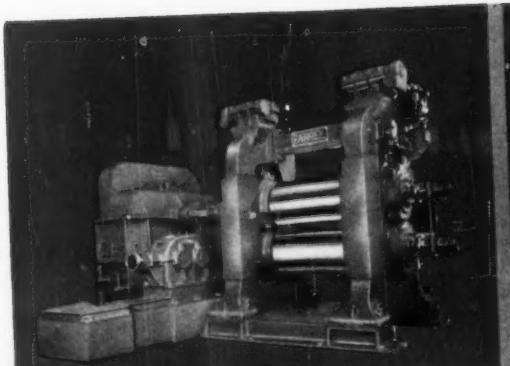
Properties of furfural-phenol resins also favor good surface appearance in the finished article, an important consideration in molding large cabinets. Dimensional accuracy of finished moldings is high.

The Quaker Oats Company does not manufacture phenolic resins but does welcome the opportunity to supply further information about the chemical, furfural, and products made from it.

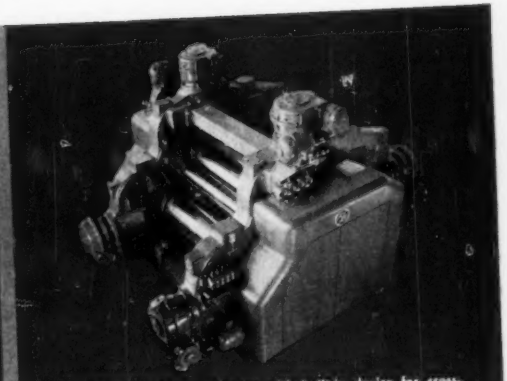
The Quaker Oats Company **CHEMICALS DEPT.**

337E THE MERCHANDISE MART, CHICAGO 54, ILLINOIS
EASTERN SALES OFFICE
1204E WHITEHALL BLDG., NEW YORK 4, N. Y.

In San Francisco, The Griffin Chemical Company In the United Kingdom, Imperial Chemical Industries Ltd., Billingham, England In Australia, Swift & Company, Pty. Ltd., Sydney In Europe, Quaker Oats-Graanproducten N. V., Rotterdam, The Netherlands; Quaker Oats (France) S. A. 42, Rue Pasquier, Paris 8E, France

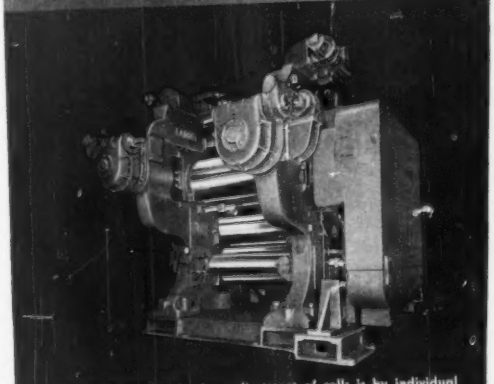


This two-roll calender has its gearing enclosed in a separate fabricated steel housing and connected to the rolls by universal couplings.



New four-roll Z-type calender with built-in device for crossing the roll axes to compensate for roll deflection. Hydraulic pullbacks eliminate backlash and hold the rolls firmly in their operating positions.

Two-roll inclined linoleum calender mounted on wheels for roll travel from oven to oven, with individual right angle motor drive for each roll, and individual motor adjustment for each screw of top roll.



In this four-roll calender, adjustment of rolls is by individual motor. Push-button control provides for adjustment of either roll end separately or both together.

WHAT IS NEW IN CALENDER DESIGN?

In the last few years, Farrel-Birmingham has been responsible for many developments in the design of heavy equipment used in initial processing of rubber and plastics. New machines have been brought out, and conventional types have been modified and improved to meet changing requirements.

Among recent refinements in the design of calenders are:

1. Precision sleeve bearings with hydraulic pullbacks for holding rolls in positive operating position.
2. Improved lubrication system which provides for rapid circulation and cooling of oil to roll neck bearings.
3. Improved oil seals which retain oil in boxes and prevent contamination of stock.
4. Rolls drilled for more effective temperature control.
5. A built-in device which provides means for crossing the roll axes to compensate for deflection.
6. Roll adjusting mechanisms that permit finer adjustment of either roll end separately or both together.
7. Drive and connecting gears removed from calender and enclosed in a separate housing.

In addition to refinements such as these, great strides have been made in designing housings, journal boxes and other parts of the proper materials, proportions and weights to withstand the stresses and strains encountered in processing a wide variety of stocks at higher speeds.

When you need a calender, why not ask Farrel-Birmingham engineers to make recommendations. Their extensive experience in designing calenders for all kinds of uses is invaluable in selecting the right machine for any specific purpose.

FARREL-BIRMINGHAM COMPANY, INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron, Chicago, Los Angeles, Houston

Farrel-Birmingham ®

FB-621

COMPRESSION MOLDING BY PROLON PLASTICS

Whether the part be a small but complicated relay housing with exacting tolerances, or a beautifully finished radio cabinet, the customer benefits from Prolon Plastics' high standards in planning and production. Whether you need large or small moldings, by compression or injection, Prolon's specialized facilities and specialized knowledge can serve you well.

FOR BETTER QUALITY, BETTER SERVICE, WRITE TO

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A DIVISION OF

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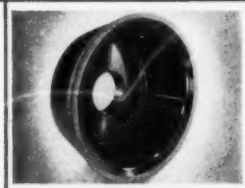
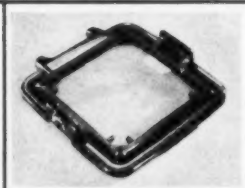
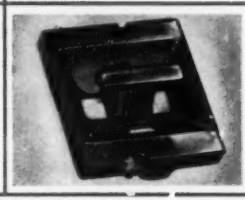
RESEARCH ★ DEVELOPMENT
DIE-MAKING ★ COMPRESSION
AND INJECTION MOLDING

HOW TO CHOOSE YOUR
HEAT RESISTANT GRADE
PHENOLIC MOLDING COMPOUND

What do you make?		Properties you need	DURITE recommends
Heater plugs and similar appliance parts.		Excellent finish and resistance to heat and moisture, improved impact strength.	For general use: 533 For highest heat resistance and impact strength: 577 Black or brown.
Cooking utensil handles, electric iron handles, etc.		Lustrous finish, good heat and moisture resistance.	For improved heat resistance: 509 For good heat resistance with higher impact: 533 For general use: 560 Black or brown.
Diamond wheel cores and similar industrial applications.		Improved impact coupled with good heat resistance.	Improved impact: 577 Black. Highest heat resistance: 739 Black or brown.
Electric waffle base, toaster bases, etc.		Lustrous finish, good heat and moisture resistance.	For general use: 560 For improved heat resistance: 509 For improved heat resistance with higher impact: 533 Black or brown.
Heavy duty switches.		Good heat and moisture resistance with good impact properties.	For general use: 739 Black or brown. For improved impact: 577 Black.

FREE! Write for catalog, fully describing the wide range of DURITE phenolics for General Purpose, Heat Resistance, Electrical Resistance, Impact Resistance—and made-to-order modifications of standard materials embodying special characteristics to meet your specific requirements. Address:

THE BORDEN COMPANY · CHEMICAL DIVISION
Dept. MP-90 350 Madison Avenue
New York 17, N. Y.

DURITE
Molding Powders · Bonding Resins · Cements

Proof that METASAP STEARATES MEAN BETTER MOLDING

Here's proof, in 3 pictures, that Metasap Stearates can help you do an excellent molding job:

1

Picture 1 shows a preform such as no molder wants. It was obtained during extensive tests run by the Watertown Manufacturing Company, and proved typical of a large number of preforms molded from compounds that did NOT contain Metasap Stearate as lubricant. Such preforms required an average pressure of 50 lbs. to eject them from the mold, and an unprofitably large percentage were delaminated in the ejection process.

2

Picture 2 shows a typical preform obtained, during the same tests, from molding compounds containing Metasap Calcium Stearate. Perfect in shape, such preforms required only 10 lbs. of pressure to release them from the mold.

Picture 3 shows how early in the manufacturing cycle the advantages of Metasap Stearates can be realized. In rolling sheets of molding compound (prior to grinding for powder) the inclusion of a Metasap Stearate aids in preventing the material sticking to the rolling mill.

3

Photos courtesy of Watertown Manufacturing Co. Watertown, Conn.

ADD IT ALL UP—and the answer is plain:

Lubricating with Metasap Stearates assures—

Improved Preforms—without delamination . . . since high ejection pressures are unnecessary.

Improved Finished Products—clean cut, with more marketable finish.

Increased Output—Rapid, easy ejection avoids waste of time and effort—assures fewer rejects.

Increased Economy—Preform molding can be done with machines of less tonnage. Molding materials are conserved. Mold life is increased—because scoring is virtually eliminated.

Metasap Zinc and Calcium Stearates, for use in molding plastics, assure significant manufacturing economies all along the line—and better products, too. Today, when you must produce *quality* and sell *competitively* you'll find Metasap stearate lubrication an indispensable aid to more profitable operation.

For complete information, write

METASAP CHEMICAL COMPANY, HARRISON, N. J.

Chicago • Boston • Richmond, Calif. • Cedartown, Ga.

METASAP CHEMICAL COMPANY

Stearates

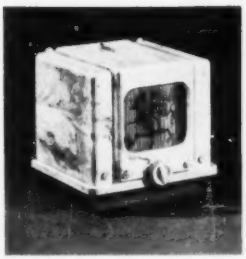
of Calcium • Aluminum • Lead • Magnesium • Zinc

PRODUCTS TO STUDY FOR IDEAS

ANTS IN YOUR PLANTS? Spray-Away kills 'em quick. Just squeeze the unbreakable Plaxpak bottle and out comes a mist of sure death for bugs. Self-atomizing bottle is always handy. Spray-Away is product of the Bulb of the Month Club, Chicago 90, Ill.

ARMY DRESS CAPS made by the Ideal Uniform Cap Co., Freeport, L. I., New York, have crown protectors of Plaxpak polyethylene film. Army tests showed that polyethylene is the most desirable material for this purpose. It's non-irritating — prevents soilage.

SKOL MAKES THE SUN a gentle skin specialist . . . converts sun-burners into sun-worshippers. And now it's packaged in the unbreakable Plaxpak bottle. Lighter and safer to pack and carry, the Plaxpak bottle makes Skol more convenient than ever to use.



FOR THE KIDS — a toy television set (Automatic Toy Company, Staten Island, N. Y.). Plax Polyflex* polystyrene sheet is used for the scope. A tough and metallically crisp material, Polyflex is low in cost, easy to assemble into plastics products.

MILLINERY DISPLAY HEAD blown from Plax methacrylate tubing can be filled with colored materials to obtain just the right setting for seasonal styles. Made by Scheuer Creations, Inc., New York 18, N. Y., it is light, chip-proof and washable.

WOOD AND PLASTICS form an effective combination in this multi-purpose table manufactured by the Three Way Mfg. Co., Los Angeles, Calif. While meeting need for durability, the Plax methacrylate corner posts add to table's eye appeal.

Oriented in two directions for greater strength, Plax Polyflex* polystyrene is a perfect "window" material for packaging, toys, and other products. It features brilliant clarity and a firm, metallic feel. In quantity, Polyflex is the lowest cost transparent sheet. Another unique Plax product is annealed methacrylate rod. It will take machining without crazing. For complete information about these and other Plax products, please write for our catalog.

PLAX BLOW-MOLDED PRODUCTS ARE MADE UNDER THE FOLLOWING U. S. PATENTS: 2128234, 2175053, 2174054, 2230195, 2230530, 2260750, 2282751, 2349178, 2349177, 2349178. *TRADE MARK REG. U. S. PATENT OFFICE.

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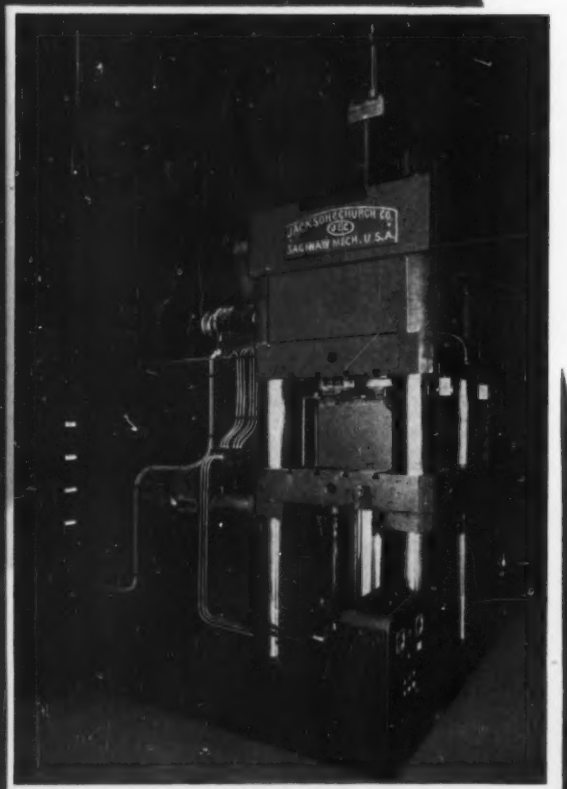
PEERLESS OPENS NEW

INSTALLS JACKSON & CHURCH 48 OZ. PRE-PLASTICIZING INJECTION MOLDING PRESS*

THE PRESS THAT PIONEERED THE MASS PRODUCTION OF STRAIN-FREE EXTRA LARGE INJECTION MOLDINGS



48 oz. Model

SPECIFICATIONS—48 OZ. MODEL

Ounces Per Shot	48 oz. (Styrene)
Time Cycle for 48 Oz.	30 Seconds
Total Poundage Per Hour	360 Lbs. (Styrene)
Pressure Per Square Inch on Material in Injection Chamber	10,000 p.s.i. Maximum
Diameter of Plunger	3¼" Diameter
Diameter of Screw	3¼" Diameter
Speed of Screw	25 to 200 r.p.m.
Projected Area	500 Square Inches
Locking Pressure	500 Tons 573 Actual
Stroke of Clamp Cylinder	27 Min. 36 Maximum
Speed of Closing	350 Inches Per Minute Slowed Down to 60 Inches Per Min. for Clamping
Speed of Opening	425 Inches Per Minute Slow Down for Knock-Out
Maximum Overall Height	19'6" to 21'
Maximum Daylight Opening	36" to 64"
Minimum Daylight Opening	0" to 37"
Distance Between Tie Rods	Left to Right 36 Inches Front to Back 36 Inches
Floor Space Required	96 Square Feet
Approximate Weight	60,000 Pounds

Styrene, colored and injection molded in one operation on a Jackson & Church Press. Simply dry-mix crystal styrene with small quantities of required die, run through J-C Press and get total diffusion of color in molded parts.

*PATENTS APPLIED FOR

Kendry PRE-PLASTICIZING PROCESS JACKSON & CHURCH CO J-C Saginaw Michigan

JACKSON & CHURCH CO.

MARKETS FOR THE WEST!

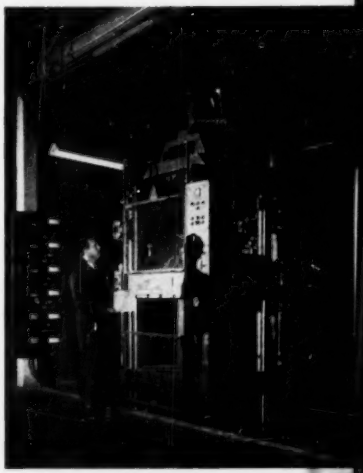
- 360 LBS. STYRENE PER HOUR
- 300 SQ. INCHES PROJECTED AREA
- 40 SECOND CYCLES

The Peerless Plastics plant, located in Culver City, California, is a model of present day custom molding efficiency.

Ever on the alert for new methods and equipment, Peerless incorporates them when better product and lower costs can be effected.

Installation of the Jackson & Church Press now places the West on an equal footing with other industrial areas in the production of large, thermoplastic pieces.

Substantial reductions in the per unit cost of present products, as well as new ones, can now be accomplished with the new machine.



Mr. Glenn Palmer, Maintenance Engineer of Peerless Plastics, Culver City, California checks final wiring installation.

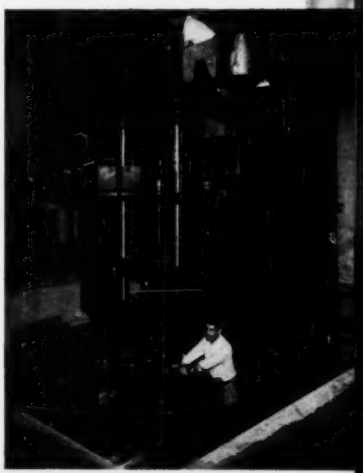
AVAILABLE NOW! STRESS-FREE NEW ITEMS, STRESS-FREE BIG ITEMS . . .

from the Jackson & Church Company's Pre-plasticizing Press with a capacity of 500 square inches projected area.

The Jackson & Church Company's Press is the all new machine that pioneered the mass production of extra large, high quality injection pieces at record speeds and at unmatched low cost. Because it operates at unheard of lower pressures than other machines, the Press is lower in cost and amazingly compact.

On a Jackson & Church Company's Press, the mold is the limiting feature. When the mold says . . . "Take the piece out" . . . the next shot is ready to go.

These are startling facts . . . possible on the 48 ounce Press—360 lbs. styrene per hour . . . 500 square inches projected area. 48—64—80—160—200—300 oz. machines now in process. Larger sizes on special order basis.



Final adjustments at Peerless. Mr. Pasco, Injection Molding Supervisor, in pit checking hydraulic unit.

AVAILABLE IN 48, 64, 80, 160, 200, AND 300 OZ. MODELS!

informative labeling in action...

INFORMATIVE Kum-Kleen labels tell the customer that these Ungar Woodburning tools are U. L. approved and SAFE FOR CHILDREN.

PRODUCTION LINE labeling speed is achieved through the use of Kum-Kleen labels and the new Avery Electric Dispenser.

THEY STICK-AND-STAY to all plastic surfaces through constant wear. In this application they are engineered to adhere even to curved surfaces.

HERE'S ANOTHER EXCELLENT EXAMPLE of informative labeling, on-the-counter salesmanship *in action*... from Ungar Electric Tools Inc., of Los Angeles. With parents of America as its sales target, Ungar Electric tells them their line of electric wood burning tools are Underwriters Laboratories approved and therefore safe for children. Ungar affixes this vital information directly on the product, at production line speed, and with low on-the-product cost through the use of the new Avery Label Dispenser and conveyor-belt rolls of Kum-Kleen labels.

This is just one of the many manufacturers who are now giving their products the extra advantages of Kum-Kleen on-the-product informative labeling at low cost and at production line speed.

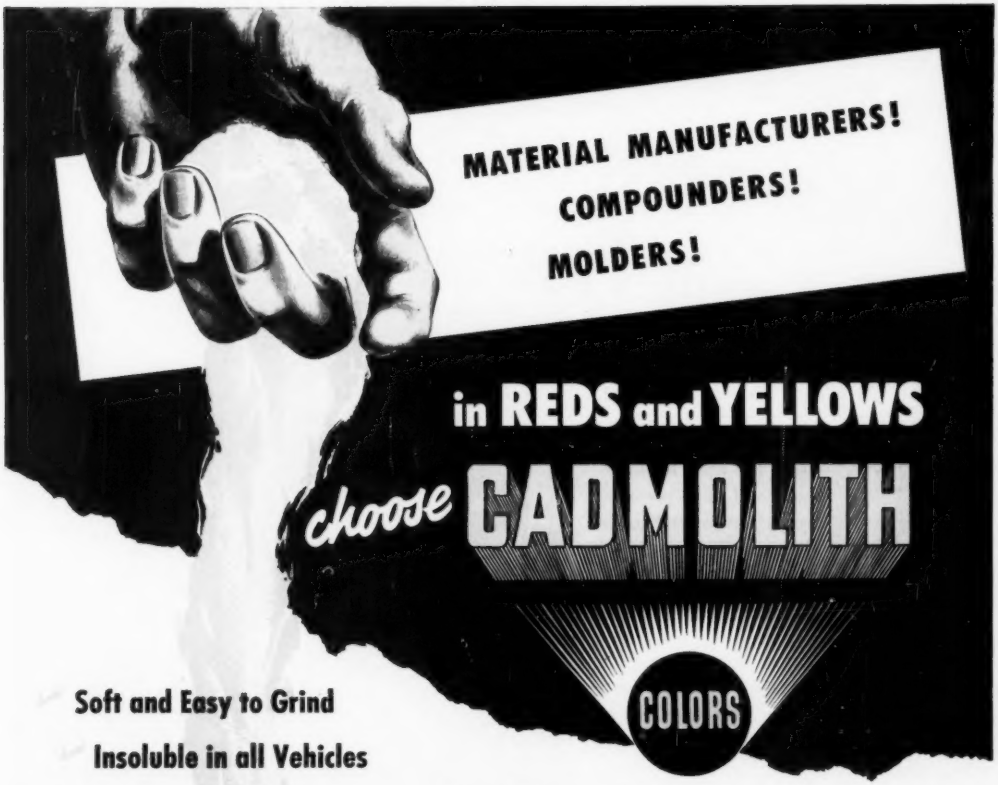
Write for samples and prices

Kum-Kleen®

AVERY ADHESIVE LABEL CORPORATION

NEW YORK CITY: 41 Park Row
DETROIT: 3049 East Grand Boulevard
CLEVELAND: 2123 East 9th Street
PHILADELPHIA: 1069 Commercial Trust Building
CHICAGO: 608 South Dearborn Street
MONROVIA, California
CINCINNATI: 626 Broadway Street

Representatives In All Principal Cities



Soft and Easy to Grind

Insoluble in all Vehicles

Alkali and Acid Resistant

High Heat Resistance

Non-Fading to Light

Non-Bleeding

Wide Range of Shades

Opaque

for Plastic Materials

Glidden leadership in pigment research has produced in Cadmolith* Colors the very finest reds and yellows available anywhere—measured by every standard of importance to material manufacturers, compounders of new and old materials and plastic molders and coaters. Where a higher degree of opacity is required, *Pure* Cadmium Reds are available in the same broad range of shades as our Cadmolith* Reds.

Send for Folder giving complete details, with color chips. Write The Glidden Company, Chemical and Pigment Company Division, Union Commerce Bldg., Cleveland 14, Ohio.

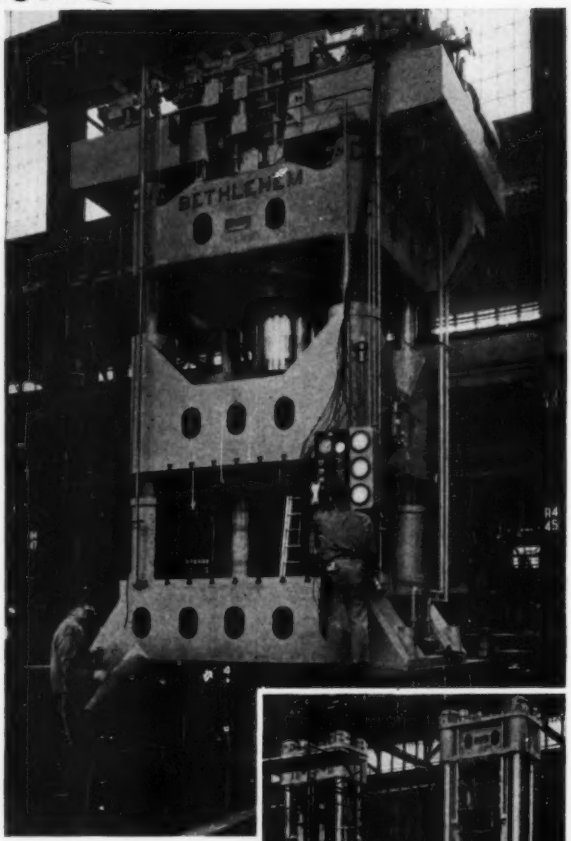
QUALITY Glidden PRODUCTS

*Trade Mark Registered

THE GLIDDEN COMPANY
CHEMICAL & PIGMENT COMPANY DIVISION
Baltimore, Maryland • Collinsville, Illinois • Oakland, California

SUNOLITH* Lithopone
ASTROLITH* Lithopone
ZOPAQUE* Titanium Dioxide
TITANOLITH* Titanated Lithopone

A service that includes every step in the planning and building of Hydraulic Presses



In addition to having full shop facilities for the building of large and small presses, Bethlehem is equipped to design these units and specify all the details. It's a service directed by engineering specialists who have practically grown up with machinery of this kind.

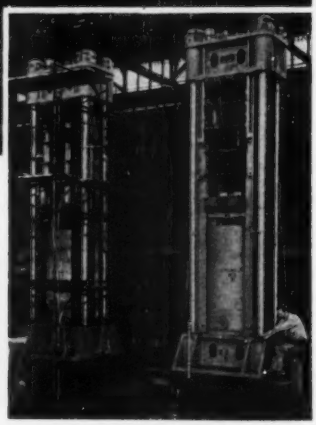
However, if you prefer to do your own designing, Bethlehem will work to your specifications and follow them exactly—or work to the plans of independent engineers whom you may designate.

Bethlehem-built presses can be fully self-contained, or can be furnished with separate hydraulic power plant and accessories. Or, they can be supplied without power equipment, so that the customer can purchase and install his own.

Call us the next time you're in the market for hydraulic presses. We make them in hot-plate, molding, and metal-forming types. You cannot buy finer ones anywhere.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation



BETHLEHEM
Custom-Built
HYDRAULIC PRESSES

BETHLEHEM STEEL

FOR PLASTICS • METAL-FORMING • WALLBOARD • FIBER BOARD • LINOLEUM • VULCANIZING

Silene® EF can help you

if you need

- AN EXTENDER FOR LIGHT VINYL FILM
- PARTIAL STABILIZER OF THE ACID ACCEPTOR TYPE
- AN ANTI-SINTERING AGENT

The favorable properties which Silene EF imparts to vinyl resins makes it extremely desirable for a wide variety of uses in the plastics field. It is valuable as an extender, partial stabilizer, reinforcer . . . helps prevent discoloration, brittleness and disintegration. As an anti-caking agent for plastic molding powders it saves regrinding and reworking. Its use results in better products and can also effect substantial savings for you.

Review your operations for a moment. If the advantages of Silene EF suggest a place in your business, why not investigate this product a little further. Complete information is obtainable by writing Pittsburgh Plate Glass Company, Columbia Chemical Division, Fifth at Bellefield, Pittsburgh 13, Pa.

A Guide to the Properties You May Be Seeking

APPROXIMATE ANALYSIS—SILENE EF

Silene EF is a white, very finely divided, precipitated hydrated calcium silicate with the following approximate analysis:

SiO_2	65.0	Bulk Density—Lbs. per cu. ft.	10±2
CaO	18.5		
Loss on Ignition	15.0	Oil Absorption	120-130
pH in water suspension	9.6		
Specific Gravity	2.1	Particle Size	Average 0.03 micron
Refractive Index	1.475		

COLUMBIA CHEMICALS

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PAINT • GLASS • CHEMICALS • BRUSHES • PLASTICS

PITTSBURGH PLATE GLASS COMPANY

PVA FOR LOW PRESSURE AND CONTINUOUS LAMINATING

The specialization of Reynolds Plastics Division in tough, fine-mil cast film makes available films particularly suited to low pressure and continuous laminating—water-soluble Polyvinyl Alcohol.

Many laminators are turning to Reynolon 4101 (1 mil) because of its extremely high yield per pound. However, where greater strength or re-use through regeneration is required, the heavier gauges (1½, 2, 3 and 4-mil) are frequently used.

Reynolds development of this film stems from its long experience in laminating packaging materials utilizing Aluminum Foil, of which the company is the world's largest producer. Reynolds also produces a general vinyl series—Reynolon 5000. Write for details.

REYNOLON 4000 SERIES—POLYVINYL ALCOHOL

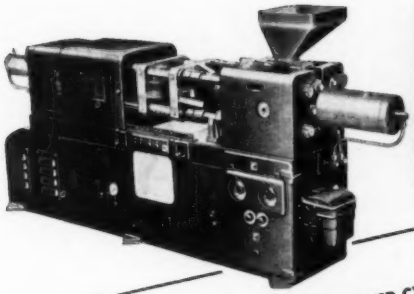
Forms available	Rolls and sheets (1)
Refractive index	1.49-1.53 (2)
Thickness range, in.	0.001"-0.004" (1)
Maximum width, in.	40" (1)
Area factor, sq. in./lb.	10,000 (.002") (2)
Specific gravity—approx.	1.21-1.31 (2)
Tensile strength, lb./sq. in.	7800-8000 (1)
Elongation %	185-253 (1)
Tearing strength (Elmendorf) gms.	High (1)
Water absorption, % (24 hrs., ⅛")	30 up (2)
Resistance to acids	Swells or dissolves (2)
Resistance to alkalis	Swells or dissolves (2)
Resistance to greases and oils	Excellent (2)
Resistance to organic solvents	Unaffected, extremely resistant (2)
Resistance to sunlight	Excellent (2)
Thermal expansion, 10^5 per °C	7-12 (2)
Resistance to storage	Good* (2)
Flammability—in./sec.	2.0 (1)
Taste	None (2)
Toxicity	None (2)
Odor	None (2)
Heat sealing temp. °F	Below 310 (5 sec. contact)

*(*Affected by high Relative Humidity)*

(1) Reynolds data.

(2) Data from printed outside sources.

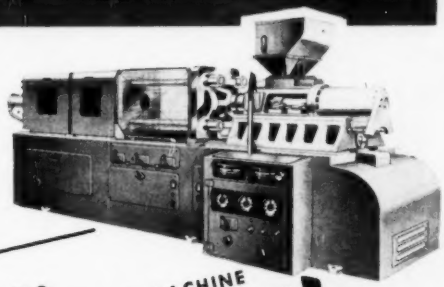
REYNOLDS METALS COMPANY
PLASTICS DIVISION
19 EAST 47TH STREET, NEW YORK 17, N. Y.



INJECTION MOULDING & EXTRUSION MACHINES MOULDS, DIES & EQUIPMENT

The
S·H·4 AUTOMATIC CONTROLLED CYCLE INJECTION MOULDING MACHINE

A medium capacity machine capable of producing articles weighing up to 4 ozs. per shot, in a wide range of plastic materials.



The
S·H·8/10 INJECTION MOULDING MACHINE

Capable of producing articles weighing up to 10 ounces per shot, in a wide range of plastic materials. The machine is of robust construction and manufactured from the highest quality materials.

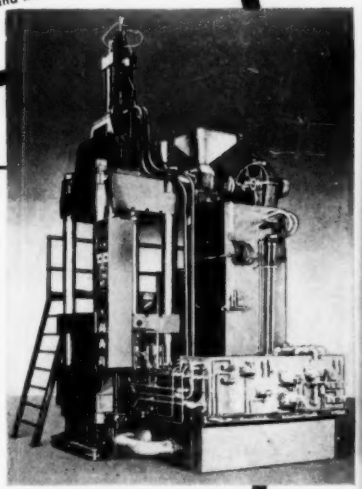
Windsor

ONE OF THE WORLD'S FOREMOST PRODUCERS OF MACHINES FOR THE PLASTICS INDUSTRY

J-C

PRE-PLASTICIZING PRESS

Available in 24, 48, 64 and 80 ounce capacity, 20-50% faster cycles. Lower injection pressures. Greater projection areas.



Sole Manufacturing and Distributing rights for the British Empire, Europe and the Argentine.

THE NEW TWIN SCREW
***RC-65 EXTRUDER**
90 mm MACHINE

- compounds
- extrudes
- colours
- reclaims scrap

Low operating and power costs. From .010" monofilaments to 10" tubes, strips and special sections. Built to American Standards of Performance.

Also available RC-100, RC-200.

J.M.D.

Enquiries to . . .

R. H. WINDSOR LTD.
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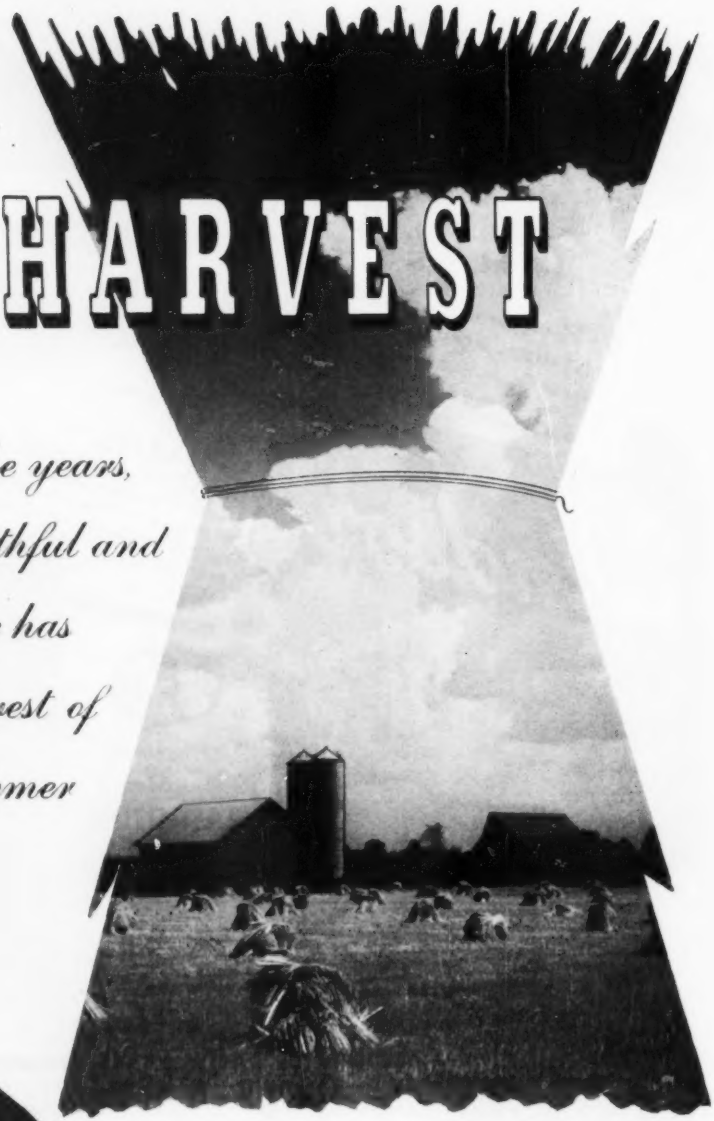
ENGLAND

Phone MONarch 8722 Cables TECHNIMACH LONDON
Grams TECHNIMACH FINSQUARE LONDON

* Exclusive Manufacturing & Selling Rights in United States, U.S.A., South America, Australia & Canada

THE HARVEST



Throughout the years, Columbia's faithful and efficient service has yielded a harvest of continued customer loyalty.

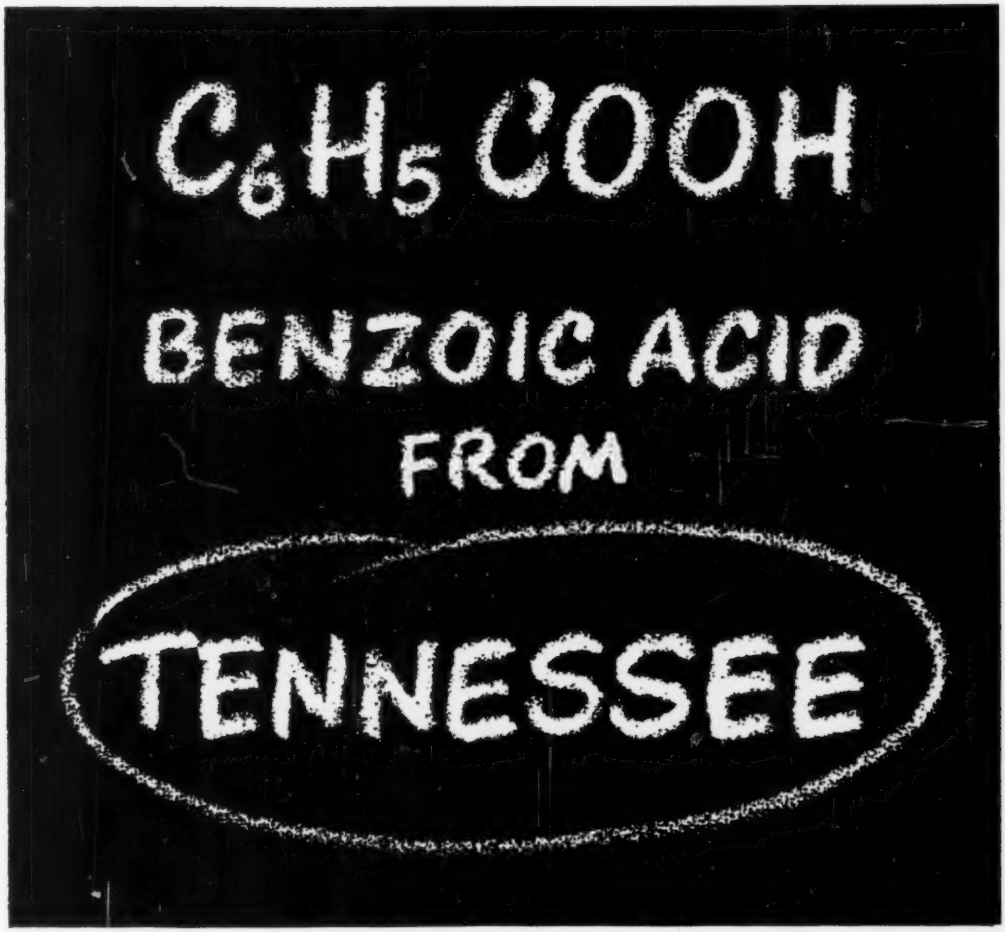
Columbia

CUSTOM MOLDERS OF PLASTIC PRODUCTS AND SPECIAL PLASTIC PACKAGING

COLUMBIA PROTEKTOSITE COMPANY • Carlstadt, New Jersey

New York Showrooms: Empire State Bldg. • West Coast Office: 380 Bayshore Blvd., San Francisco, Calif.

ONE OF AMERICA'S LEADING MANUFACTURERS OF SUN GLASSES, COMBS, BRUSHES, TOYS, HOUSEWARES



More and more buyers of chemicals are becoming quality conscious, and particular buyers are conscious of quality in chemicals from Tennessee.

Dependable quality is assured because we produce our chemical products from basic raw materials under conditions of rigid laboratory supervision. Integrated production is a safeguard of quality. It enables Tennessee to maintain strict "on time" deliveries.

We'll gladly send you specifications. Stocks at key points enable you to get deliveries without delay.

For particular needs in heavy or fine chemicals, it's a good rule to see that they always come from Tennessee.

TENNESSEE
PRODUCTS & CHEMICAL
Corporation
NASHVILLE, TENNESSEE

- MOTHER OF PEARL
- TINSELS
- PHOSPHORESCENTS
- CUSTOM-MADE COLORS
- EDGELIGHTING MATERIAL

Special Colors!
Special Effects!
at low, low prices!

CREATED IN AMPACET* POLYSTYRENE

*Reg

BY AMERICAN MOLDING POWDER & CHEMICAL CORP.

AMPACET PEARL—the eye-catching and alluring plastics material for jewelry boxes and containers of all kinds, for clock and instrument housings, for toys and baby items, for bathroom fixtures and wall tile, for novelties and hundreds of different uses, for brushes, toilet-ware and cosmetic articles. Economical, because it blends with crystal Polystyrene. Formulated for easy molding and good impact resistance.

PHOSPHORESCENT—for products that should glow in the dark and look well in daylight. Articles made from Ampacet Phosphorescent Polystyrene retain their beautiful finish, their warm, appealing glow.

METALLICS AND TINSELS—Unusual effects of sparkling brilliance and beauty—gold, silver, copper and bronze Polystyrene, and metallic tinsel flakes imbedded in transparent plastics material.

IRIDESCENT POLYSTYRENE (EDGELIGHTING MATERIAL)—the two-tone effect successfully employed for edge lighting in advertising display material.

COLOR
can help launch a new product dramatically

COLOR
can put new sales appeal into an old product

We custom color to your specifications—colors are matched accurately and kept constant time after time.

Get Out Of The Rut Of Standard Colors with low priced AMPACET Polystyrene.

(Also Manufacturers of AMPACET Cellulose Acetate Molding Powder)

ANY COLOR • • • ANY FLOW • • • AT LOWER PRICES

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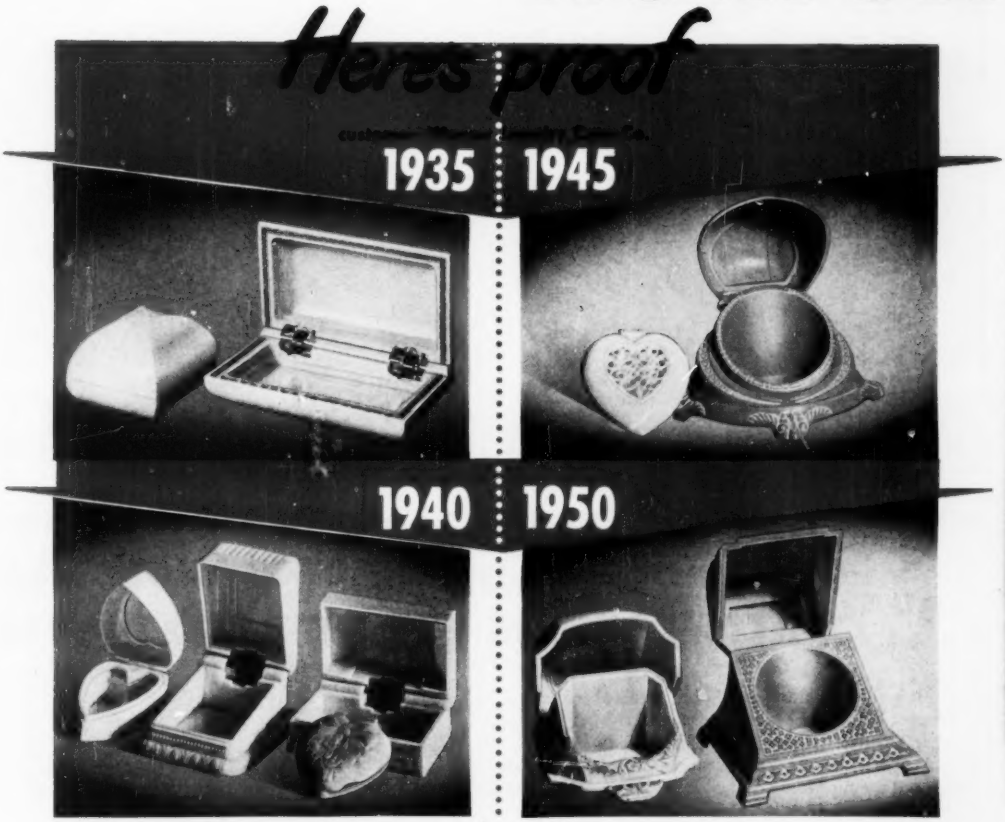
CUSTOMERS RE-ORDER
with confidence from NORTON



How's this for convincing testimony of customer confidence and satisfaction:

The first box Norton Laboratories produced for the Warner Jewelry Case Co. was injection molded back in 1935, a full fifteen years ago. And ever since that initial order was delivered, Warner has been a steady customer and friend of ours.

The reason so many of Norton's customers are *old* customers should interest you. When dealing with Norton, buyers of injection and compression molded plastics discover a combination they appreciate — sound engineering, cooperative service, flawless molding, sensible pricing, dependable deliveries.

Norton is interested in cultivating your molding business. Ask for a free survey of your next molding assignment by a Norton engineer from our nearest sales office. Write today. Norton Laboratories, Inc., Lockport, N. Y. Sales Offices: *New York—347 Fifth Avenue; Chicago—5221 Kimbark Avenue.*

NORTON *Laboratories, Inc.*

COMPRESSION AND INJECTION MOLDING

Assembly Line Scene at Welding Engineers: Final Inspection of a "Model 3552" prior to delivery—and a "4552" in the construction stage.

PARTNERS IN PRODUCTION!

NOW—America's Leaders in the Plastics Industry Choose WELDING ENGINEERS' DUAL WORM COMPOUNDER-EXTRACTOR-EXTRUDER

It is significant that those who command leadership in the plastics field are equipping their plants with the Welding Engineers' Compounder-Extractor-Extruder*. They recognize the PROVEN advance in Welding Engineers' design and the superiority of this outstanding machine over "old-fashioned methods" . . . on every production count: Speed, Close Tolerance, Controlled Finish and *Economy*.

Compounding, coloring, moisture-removal and cutting of pellets at the die and finished extrusions are accomplished in ONE step—No pre-drying! No pre-heating! No costly separate operations! NOW is the time to equip your plant the Welding Engineers' way. Process rigid and highly plasticized Vinyls, all types of Polystyrene, Wet Acetates, hard-to-handle Nylons, tough Cellulosics and Acrylics without asking favors of any production schedule.

*Patents Pending and Issued

MACHINERY DIVISION

WELDING ENGINEERS, INC.

NORRISTOWN, PA.

SEND YOUR COMPOUNDING AND EXTRUDING PROBLEMS TO US!

MANUFACTURERS OF IMPROVED MACHINERY FOR THE PLASTIC, CHEMICAL AND PETROLEUM INDUSTRIES

"no more GAMBLING on tool steel selection"

[⅓ actual size; Selector is in 3 colors]

Since the first announcement, hundreds of tool steel users have received their CRUCIBLE TOOL STEEL SELECTORS. The comments received indicate that this handy method of *picking the right tool steel right from the start* is going over big.

"Handiest selector I've ever seen"

"No more gambling on tool steel selection"

"You're right, the application should dictate the choice of the tool steel" . . . and many, many more favorable comments.

You'll want your CRUCIBLE TOOL STEEL SELECTOR. It uses the only logical method of tool steel selection—begin with the application to pick the right steel! And the answer you get with one turn of the Selector dial will prove satisfactory in every case, for the CRUCIBLE TOOL STEEL SELECTOR covers 22 tool steels which fit 98% of all Tool Steel applications. ALL the tool steels on the Selector are in Warehouse Stock . . . that means when you get the answer, you can get the steel . . . fast!

Write for your Selector today! We want you to have it, because we know you've never seen anything that approaches your tool steel problems so simply and logically. Just fill out the coupon and mail. Act now! CRUCIBLE STEEL COMPANY OF AMERICA, Chrysler Building, New York 17, N. Y.

Here's how it works:

To use the Selector, all you need know is the characteristics that come with the job: type and condition of material to be worked, the number of pieces to be produced, the method of working, and the condition of the equipment to be used.

FOUR STEPS—and you've got the right answer!

1. Move arrow to major class covering application
2. Select sub-group which best fits application
3. Note major tool characteristics (under arrow) and other characteristics in cut-outs for each grade in sub-group
4. Select tool steel indicated

That's all there is to it!

Here's an example:

Application—Deep drawing die for steel

Major Class—Metal Forming—Cold

Sub-Group—Special Purpose

Tool Characteristics—Wear Resistance

Tool Steel—Airdi 150

One turn of the dial does it!

And you're sure you're right!!

Crucible Steel Company of America
Dept. MO, Chrysler Building
New York 17, N. Y.

Gentlemen:

Sure! I want my CRUCIBLE TOOL STEEL SELECTOR!

Name _____ Title _____

Company _____

Street _____

City _____ State _____

CRUCIBLE first name in special purpose steels

TOOL STEELS

fifty years of Fine steelmaking

Branch Offices and Warehouses: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHARLOTTE • CHICAGO • CINCINNATI • CLEVELAND • DENVER • DETROIT HOUSTON, TEXAS • INDIANAPOLIS • LOS ANGELES • MILWAUKEE • NEWARK • NEW HAVEN • NEW YORK • PHILADELPHIA • PITTSBURGH • PROVIDENCE ROCKFORD • SAN FRANCISCO • SEATTLE • SPRINGFIELD, MASS. • ST. LOUIS • SYRACUSE • TORONTO, ONT. • WASHINGTON, D. C.

it's easy to "make ends meet" with Aico plastics

BENDIX RADIO DIAL

uses plastics to keep pace with the production of New '50 FORDS. Dials are injection molded . . . one every 1½ minutes. Green Lucite is used because of its permanent color and ability to diffuse and transmit light.

"Making ends meet" on the production line . . . *and in the cost department* . . . is no problem when Aico molds your plastic parts. With over 30 years experience to guide us, we can accurately advise the most economical type of mold to meet your production requirements. With our extensive facilities, you can depend on Aico to deliver parts in *any volume* to keep pace with your most rigid production schedules. Write for our free "Portfolio of Plastic Applications" that shows how Aico plastics have helped many other manufacturers make ends meet . . . both in production *and cost.*

AMERICAN INSULATOR CORPORATION
New Freedom, Pa.

Many things are better because of Aico MOLDED PLASTICS

MODERN PLASTICS

VOLUME 28 SEPTEMBER 1950 NUMBER 1

Soft Products for Hard Use . . .

Molded of Elastomeric Vinyls

ALTHOUGH the volume of elastomeric vinyl material being molded is still relatively small in comparison with some of the "workhorse" plastics, more and more molders and manufacturers are turning to these versatile materials on jobs where their special properties can be utilized to advantage. A large luggage manufacturer, for example, is using this material for molded luggage bindings, while a prominent eastern molder has found it particularly well suited for a colorful new line of dog collars and leashes. Among the many other current applications are such items as ice cream cabinet lid gaskets, refrigerator and toilet seat bumpers, automotive lock plunger handles, vacuum cleaner parts and accessories, and colorful, non-skid feet for business machines.

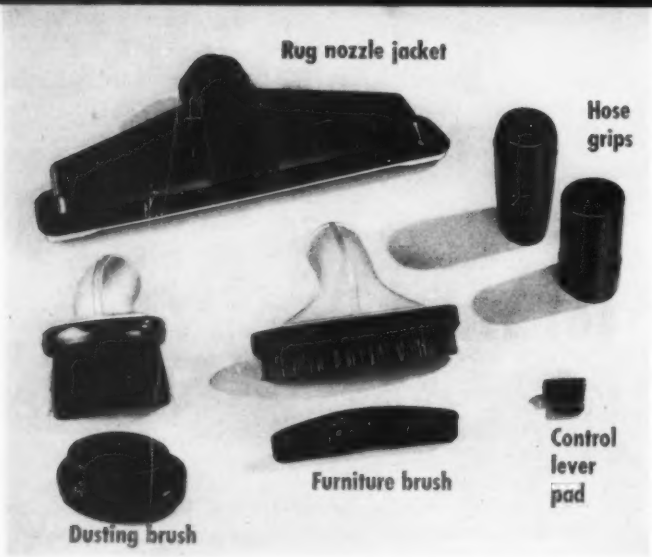
The elastomeric vinyl materials are characterized by their flexibility plus a wide range of valuable properties which they share with the entire vinyl family, such as unlimited color range, non-toxicity, water and chemical resistance, and superior aging qualities. High dielectric strength, oxidation resistance, and ability to withstand abrasion and flexing are other important attributes of the materials. Some of the compounds resist oil and greases, and others offer the advantage of non-flammability.

These specialized materials are formulated for specific applications where their unique qualities give sales or performance features not otherwise obtainable. In most instances, the material they replace is rubber, but a survey of current applications shows them also supplanting metal, leather, and other traditional materials.

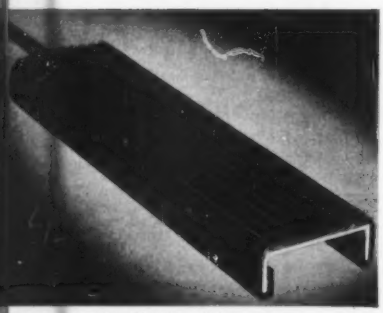
An outstanding advantage of these materials is their ability to be varied to meet the particular requirements of the end application. The range of flexibility, for example, may be varied from a soft, rubbery state to semi-rigid, depending upon the type and amount of plasticizer used in combination with the required basic

[illegible]eric vinyl compounds can [illegible]ded by either the compres-[illegible]or injection method. In most cases, the latter is more desirable because of lower operating costs and faster production. The molding compound, in addition to the basic vinyl resins and plasticizers, con-

Visible elastomeric vinyl parts for vacuum-cleaner accessories are rug nozzle jacket, one hose grip, and guard on dusting brush in cleaner kit



Use of soft vinyl moldings on cleaner accessories eliminates need for finishing metal, permits color match with other parts, and protects the furniture

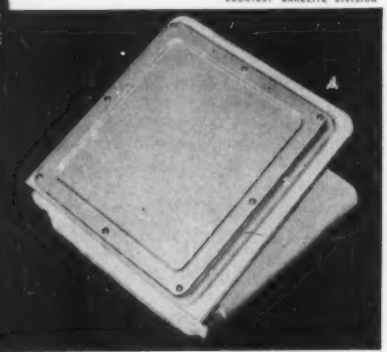


COURTESY BAKELITE DIVISION

Non-slip tread on sleeping-car ladder is also abrasion resistant

Gasket for ice-cream cabinet lid is of non-marring molded vinyl

COURTESY BAKELITE DIVISION



tains plasticizers, lubricants, pigments, and fillers which combine to produce the desired qualities in the molded part.

Compounding the Material

Plants which are equipped to handle their own compounding may purchase the vinyl resins and other materials from several suppliers serving this field. Although compounding details vary according to specific materials and equipment, a typical compounding operation involves pre-mixing, addition of the plasticizer, fusing of the pre-mix on mills, granulation before molding.

In the pre-mixing operation, carried out in conventional mixing equipment such as dough mixers, ribbon blenders, pony mixers, or tumbling blenders, the dry components are charged into the blender and thoroughly mixed. Then the plasticizer is added and wetting of the dry components begun. This stage of the process may be accomplished either with or without heat, although use of heat is usually recommended.

The pre-mix is then fused on a heated two-roll open mill or first on a Banbury and then on a mill. Recently, fluxing by new types of multiple screw extruders and by single screw extruders of special design has gained acceptance. Granulation of the fluxed compound may be carried out by feeding slabs or ribbons of stock from the mill directly to a chopper, or stock from the mill may be fed to a plasticizer or extruder and extruded in filaments or ribbons which are then cooled and chopped into granules of proper size. Dry blends of vinyl resin compounds are fed directly from the pre-mixer to the extruder after compounding.

Among the newer material developments in this field is Geon 101-EP, introduced recently by B. F. Goodrich Chemical Co. This is a straight polyvinyl chloride resin with processing features permitting substantial reductions in compound mixing cycles, especially in powder and Banbury mixing. With relatively inexpensive mixing equipment, commercial molding and extrusion compounds containing this resin have been powder mixed in four minutes. The resin readily absorbs plasticizer at temperatures between 200 and 240° F., producing dry, free-flowing powders. Among additional benefits of powder mixing are 1) low inventory of materials; 2) simplified color matching in a wide range; and 3) fast processing schedules.

Molding Problems

The molder must bear in mind that, in continuous use, elastomeric vinyl compounds have a corrosive action on iron or steel. While molds need not be made from special metals, it is desirable that their molding surfaces be hard chrome plated. The internal surfaces of the heating cylinder and all heated parts which are in contact with the resin should be made of Hastelloy B, Z-Nickel, or given a 0.002 in. plating of hard chromium. These materials eliminate the catalytic decomposition effect of iron or steel on polyvinyl chloride compounds; also, because of their frictional characteristics, they reduce the ram pressure required to effect extrusion.

Close control of molding temperature is imperative, both in the interest of satisfactory molded pieces and of protection of equipment. One molder who has had considerable experience with these materials says that the allowable temperature range for good molding is only about 10 or 15° F., varying with the hard-

ness of the formulation. According to this source, a material of 60 hardness might mold satisfactorily in a range of 330° F. plus or minus 10, while for 90 hardness, the range might be 400° plus or minus 10.

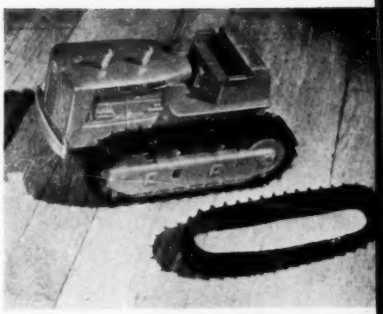
"We have found no specific rules to follow which will guarantee successful molding," reports another company. "Each job requires individual treatment to an even greater extent than any of the other thermoplastics. We have found that material temperatures vary considerably from mold to mold, even using the same material. They range from 335 to 390° F. and should be held as low as possible." Some operators advise gradually raising cylinder temperature to the proper point for molding, being careful to avoid a temperature so high that browning of the material results.

Complete plasticizing of the material is an important factor in obtaining a glossy finish on the molded part without flow and weld lines. "Improperly plasticized material," says Frank A. Martin of the engineering division of The Hoover Co., "frequently results in evidence of both overheated and cold material showing up in a single molding. The overheated material generally shows up as small spots resembling a raindrop pattern, while cold material results in no gloss at all. Since all vinyl materials are easily decomposed by heat, it is a difficult matter to get good plasticizing action in the heater without having decomposition set in."

Because of the problem of thermal decomposition, it is not possible to heat a vinyl compound considerably above its flow point, as is done with some rigid materials. Hence, higher pressures must be used and it is desirable to use a machine with a long cylinder in order to permit thorough heating and plasticization before the material arrives at the nozzle. If a machine with a regular length cylinder is used, it is then desirable to use a mold smaller than the machine's rated capacity.

Prevention of material breakdown in the cylinder frequently poses a problem. At the Hoover plant, breakdown is held to a minimum by never leaving hot material standing in the cylinder. The heat is always turned off before stopping the molding, and the machine operated as long as the mold can be filled. Then the unit is purged at intervals until the material no longer flows.

If too high a cylinder temper-



COURTESY BAKELITE DIVISION

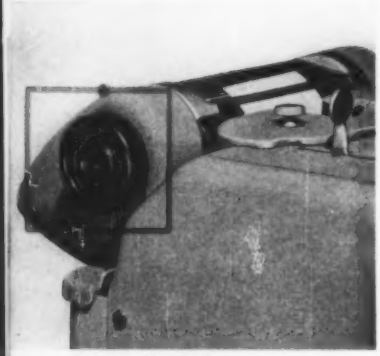
Realistic treads on model tractor are molded of flexible vinyl

Life-like miniature dolls are unbreakable, soft, easy to clean

Vinyl hair curlers, molded in four colors and three sizes, are soft and pliable, comfortable to sleep on, and impervious to permanent wave solutions

COURTESY BAKELITE DIVISION

Vinyl insulating shields make electric clamps easy to handle



COURTESY BAKELITE DIVISION

Vinyl typewriter twirler knobs resist perspiration, body oils

ature causes the material to "burn," it adheres to the chamber, torpedo, and ram. If clear material is run later on the same machine, the burned material will flake off for long periods, producing spoiled pieces. To overcome this difficulty, the affected machine parts must be taken apart and scraped clean.

With reference to mold design, there appear to be no special requirements except that generous runners are advised. Some operators believe that too large a gate causes the material to "roll" in entering the mold, resulting in weld lines. A gate having a relatively flat cross section is one way to avoid this difficulty. Proper gate location is also regarded as important in obtaining a good surface finish.

Recent investigations of pinpoint gating for elastomeric vinyl material have been a factor in widening their field of application. According to Bakelite Division, this type of gating, using gates from 15 to 40 mils in diameter, "solved much of the problem of consistently producing a uniform gloss and a surface free from dull spots. It was found that fill-out was also improved in a large number of cases.

Material Selection

In the matter of material selection, Mr. Martin of Hoover states that those materials with low filler content tend to give better surface finishes. "Also," he says, "the softer resins seem to be better in ease of molding, *i. e.*, those with higher acetone content. Vinyls for injection molding should be even better stabilized than for extrusion."

Because of the elastomeric nature of the material, ejection from the mold requires special attention. Generally, special ejection systems and sprue-pulling devices are necessary. More careful handling of the piece as it comes from the mold is necessary to avoid permanent deformation. This is particularly true in thick-section pieces. In some cases, a longer than usual cooling period in the mold may be necessary.

Items having severe undercuts are no additional problem with the elastomeric vinyl materials, since the flexibility of the plastic permits it to be stripped from the die without the need for expensive side cores. Shrinkage allowances vary with the formulation, and even in the same material on different parts. A shrinkage of from 1.5 to 2.0% is considered normal.

Selection of elastomeric vinyl for a molding job depends upon a number of factors. On some types of small parts the more rapid molding cycle of the vinyl, as compared to rubber, is sufficient to offset the higher cost of the plastic. In other instances, elastomeric vinyl may be specified despite the cost factor because of superior characteristics in the finished application.

These points are well brought out by Mr. Martin as follows: "We have found it economical to substitute vinyl for rubber when the parts weigh two or three ounces or less. On such parts, the rapid injection cycles compensate for higher material cost. Above three ounces, rubber moldings are generally less expensive. . . . We have found that we can replace rubber with elastomeric vinyl moldings in a great many instances. We feel that we are getting better appearance, unlimited color possibilities, toughness, scuff resistance, better aging and longer life, and freedom from mark-off since substituting the vinyls for rubber (on vacuum cleaner parts). The vinyls are inferior in respect to heat resistance, permanent set, and cold flow."

In Vacuum Cleaners

For years a leading producer of vacuum cleaners, the Hoover organization is using precision molded elastomeric vinyl to form tight-fitting jackets for its vacuum cleaner accessories. Molded in a rich brown color, the jackets give the parts a pleasant touch and protect furniture, floors, etc., against scratching or marking. In size and weight the parts cover a broad range, varying from the tiny handle control lever pad to the ingeniously designed rug nozzle jacket, measuring more than 12 in. from tip to tip and over 4 in. wide. Use of the soft vinyl moldings over this and other Hoover pieces eliminates the

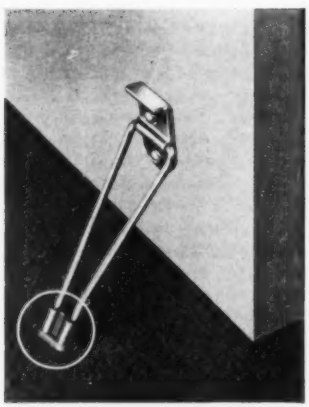
Elastomeric vinyl feet on adding machine prevent scuffing of desks, keep machine from "walking"

COURTESY CHICAGO MOLDED PRODUCTS CORP.

Colorful handlebar grips are molded of vinyl in three styles. Internal ribs provide cushioning effect, insure secure grip

Dog leashes and collars of elastomeric vinyl resist exposure and aging. Handle is molded as an integral part of the leash

PHOTOS ON THIS PAGE COURTESY BAKELITE DIVISION



Door stop foot of elastomeric vinyl provides traction, avoids gouging rug or scuffing floor

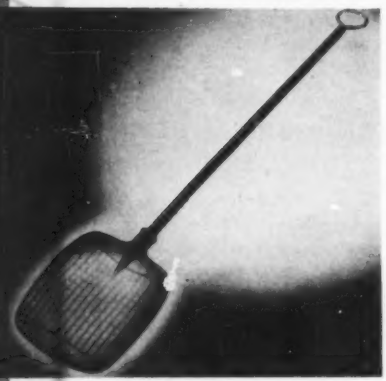
need for a finishing operation on the metal accessories, in addition to supplying the desired protection. Several of the jackets also carry the Hoover name, molded in relief.

Among other Hoover vinyl pieces is a dusting brush guard, consisting of two concentric oval collars molded as a unit. The inner collar projects down inside the dusting brush, supporting the long bristles in an open position and covering the metal ring in which they are anchored. A similar function is served by the furniture brush hair support, molded in black vinyl because it is a non-appearance item. Tubular hose grips are other Hoover moldings which serve a functional purpose and also contribute to the smart, modern appearance of the unit.

Hungerford Plastics Corp., Murray Hill, N. J., is another leader in elastomeric vinyl molding. Outstanding among the items made by this company are colorful atomizer bulbs and a line of dog collars and leashes in a choice of six colors. Made in 13 sizes, the collars will fit all canine breeds from Chihuahua to St. Bernard. Complete all-vinyl leashes and molded grips for chromium-plated chains are produced in matching colors. Each collar and leash has the size molded directly on the item, along with the range of neck sizes which each collar will fit. A handy feature is a small pocket molded into each collar to hold an identification tag.

Hungerford has also introduced a line of handlebar grips for bicycles, which may also be used on lawn mowers, for tool handles, and in similar applications. Made in three sizes and three styles, the

Resilient, injection-molded refrigerator bumpers cushion door



COURTESY THE ODOR SWAT CO.

Fly swatter's vinyl head has no wires to fray—will not mar wall

COURTESY BAKELITE DIVISION

Vinyl automotive distributor cap nipples are superior to rubber

grips have a smooth, glossy surface and bright, integral color. Longitudinal ribs provide a firm grip on the handlebar and a comfortable cushioning effect. This company is also a major producer of elastomeric vinyl doll components.

Another firm doing a notable job of elastomeric vinyl molding is Tip-Top Products Co., Omaha, Neb., whose line of hair curlers leads the field in popularity and sales. Claude D. Gresham, head of the company, reports that elastomeric vinyl curlers now represent about 50% of the firm's curler sales. Tip-Top's Dream curlers, attractively carded for volume sales, are molded in pink, brown, blue, and green and in three sizes—Regular, Little Miss, and Tiny. The new small size, designed for use on short hair, has also become very popular with children.

The elastomeric vinyl material, Mr. Gresham reports, "is particularly desirable for hair curlers, not only from a color standpoint, but because of the fact that it is soft and pliable, and comfortable to sleep on. Inasmuch as it is also unaffected by permanent wave solutions, it is rapidly becoming very popular as a curler to use with the home type permanents now on the market."

Luggage Bindings

Among the largest pieces being molded of elastomeric vinyl are the bindings of Samsonite luggage, which also has sheet vinyl outer coverings. The Samsonite bindings, formerly made of top grain chrome tanned cowhide, were switched over to molded vinyl (Velon) in January, 1949.

Five sets of molds are required to produce the five sizes of bindings for the full line of luggage. They are of four-cavity construction, making one complete set of bindings per one-minute cycle. Molding is done on three 22-oz. Impco injection presses in the Denver, Colo., plant of Shwayder Bros., Inc., manufacturer of Samsonite. The bindings are run in natural rawhide, cordovan, and saddle tan to harmonize with the case colors.

Attractive and colorful, the molded vinyl bindings provide an extremely tough, long-wearing surface which will absorb plenty of punishment. They will not tear and are not easily snagged. Like the vinyl coverings, they are stain-proof and easily wiped clean with a damp cloth.

At its Plastics Div. plant in Milwaukee, Nash-Kelvinator Corp. molds gaskets of elastomeric vinyl material for its ice cream cabinet lids, which have tops of modified styrene. Each pair of lids has two of the U-shaped gaskets. Gleaming white in color, the gaskets consist of a special type Vinylite elastomeric molding compound which is non-marring, has good flexibility at low temperatures, resistance to cold and cracking, and good low-temperature impact strength. Despite their undercut design, the gaskets are readily stripped from the molds.

In the toy field, the elastomeric vinyls appear to have a great future. Items molded from the material are soft and safe to handle and will not break, even when subjected to abuse. Thomas Manufacturing Corp., Newark, N. J., has developed a complete group of miniature doll and pet figures molded of Vinylite elastomeric material whose market acceptance has been phenomenal. The company reports that approximately one hundred million of the dolls have now been produced. These life-like dolls and their pets can be bent, bathed, dropped, chewed upon, and otherwise "child-handled" without serious consequences.

An ingenious consumer item for which elastomeric vinyl proved particularly suitable is the unconditionally guaranteed Odor-Swat fly swatter, developed by The Odor-Swat Co., Brecksville, Ohio. This product uses a molded flexible vinyl head of ribbed, perforated design in combination with a 22-in. extruded cellulose acetate handle. The hollow handle, made by Carter Products Corp., Cleveland, Ohio, contains deodorizing essential oils which are forced out through small openings when the swatter is used.

The virtually indestructible swatter may be washed clean with soap and water. It has no wires to fray and, unlike rubber swatters, will not mar walls or woodwork. The elastomeric vinyl heads, made in several attractive colors, are produced in a three-cavity mold on a 16-oz. Reed-Prentice machine, using a molding cycle of approximately 60 seconds. A major problem is the cold

(*Continued on p. 166*)

New Fields for Ion Exchange Resins

by PAUL KLAAS*

IN recent years, several new types of plastics in the form of insoluble acids and alkalies and known as ion exchange resins have appeared on the market. These materials are playing an increasingly important role as industrial chemicals in their own right. Ion exchange resins have revolutionized the water conditioning field during the past decade, and seem destined to introduce far-reaching changes into such varied industries as the production of sugar, the recovery of metals, and the manufacture of drugs.

Ion exchange resins were first produced commercially in this country by Rohm & Haas Co., whose chemists have since succeeded in greatly improving their properties and extending their usefulness. Now, in addition to the Rohm & Haas Amberlites, there are available other ion exchange resins from The Dow Chemical Co., The Permutit Co., and Chemical Process Co.

Like many other types of plastics, ion exchange resins are usually based upon styrene or a similar material. In the manufacturing process, the plastic is formed into small granular or bead-like particles, each of which contains billions of acidic or basic groups. When placed in contact with water or a similar liquid, the acidic or basic groups are able to act upon the liquid in much the same manner as if they were dissolved in it as soluble acids or bases. Because the groups are attached to an insoluble plastic, however, they do *not* dissolve in the liquid and hence may be removed at will.

Ion exchange was first observed by two English scientists named Way and Thompson, who over a century ago discovered that if a solution of one kind of salt, such as ammonium sulfate, is passed into certain classes of soils, the solution recovered from the soil will contain an entirely different kind of salt, such as calcium chloride, with practically none of the ammonium sulfate originally present. Way and Thompson were baffled by their observations, but we now know that this apparently amazing transformation is effected by a simple swapping of ions, not unlike the changing of partners at a square dance.

*Rohm & Haas Co., The Resinous Products Div.

Water Softening

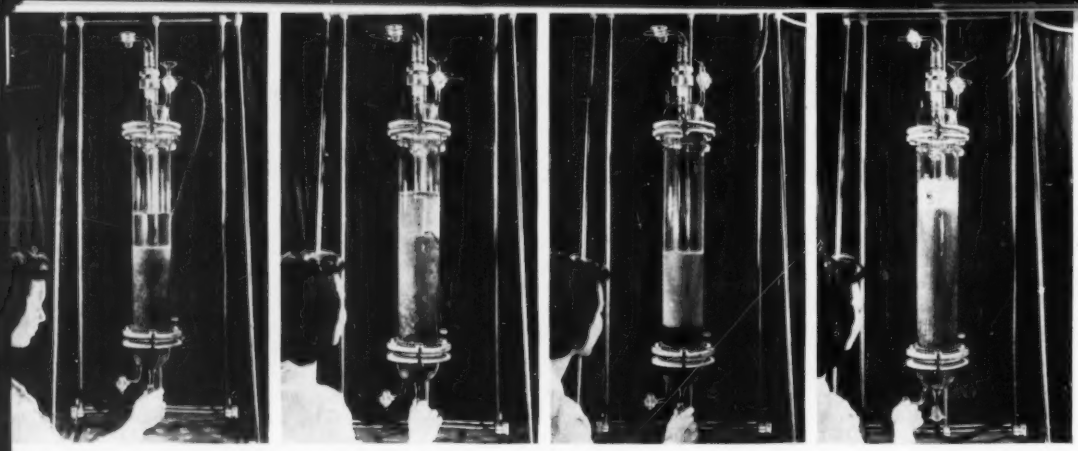
Today, that swapping is carried out by synthetic resins in thousands of water-softening installations, especially in the Midwest and Southwest. There, cation exchange resins such as Amberlite IR-120 are being used on a very large scale for softening hard waters. Hardness in a water supply is commonly due to lime salts such as calcium chloride. When such salts are present in a raw water to the extent of only a few hundred parts per million, an objectionable scum forms when soap is added, and heavy deposition of scale may occur when the water is evaporated in a teakettle or industrial boiler. Most of the troubles encountered in dealing with hard waters can be eliminated by trading the objectionable calcium and magnesium ions in the water for sodium ions adsorbed on the resin: the resulting treated water contains salts just as before, but these sodium salts will not form bathtub scum or teakettle scale. Sooner or later, of course, all of the sodium ions originally present on the resin will have been traded for calcium ions, and the resin will lose its softening capacity. At this point, the bed of resin is merely treated with strong brine; the sodium ions of the brine solution are now adsorbed on the resin again, while the calcium ions appear in the waste and are discarded. The column of resin is now ready for another softening cycle, and can be used again and again.

Deionization

Sometimes, of course, even sodium ions and chloride ions are objectionable in a water supply, and water completely free of all ionic materials is required. In the past, water of such high quality was usually obtainable only by distillation; now, however, an ion exchange process known as "deionization" does the job inexpensively. In this process, two different types of synthetic resins are used. One exchanges hydrogen ions for objectionable metal ions such as sodium, calcium, and magnesium ions etc.; the other removes the anions—the chlorides, sulfates, etc.—and exchanges hydroxyl (OH) groups for them. The result is a water free from almost all dissolved salts.

In one of the most recently developed methods of deionization (known as the Amberlite Monobed method of deionization) only a single column containing a mixture of cation exchange resin particles and anion exchange resin particles is required, and the cation and anion exchange processes occur simultaneously. Water of astonishingly high quality can be produced by the Monobed method, and the two resins, differing considerably from each other in density, can be easily separated and regenerated. After the cation exchange resin has been regenerated with acid and the anion exchange resin with alkali, the resins can be re-mixed by simply bubbling air through the column.

One manufacturer has made good use of the Monobed principle in a small, portable unit that delivers water of extremely high quality for use in storage batteries, photographic solutions, and laboratory work. Another has developed a Monobed unit housed in a small styrene tube. In this portable unit, the resin bed is dyed dark blue. As the capacity of the resin for removing ions from water becomes exhausted, the bed turns yellow-brown, giving the user a continuous, visible check on the capacity still remaining. Other Monobeds in steel units several feet in diameter deliver completely dionized water to high pressure boilers. Others are being developed for applications in which water of almost perfect quality is not needed—in the treatment of brackish waters for irrigation or



Laboratory apparatus for employing the Monobed method of deionization using two ion exchange resins. Left to right—The solution to be treated passes through the resins until their deionizing capacity is exhausted. The resins are then separated by an upflow of water, regenerated with caustic and acid, and finally remixed by a stream of air

in the reduction of the solids content of industrial wastes, for example, where a mere reduction in dissolved solids is necessary (but heretofore usually impractical by ion exchange).

Food Applications

In the production of sugar, highly porous Amberlites, which are especially designed for the adsorption of very large molecules, such as the colored bodies of beet, corn, and cane syrups, are being developed in the expectation that ion exchange resins will gradually replace bone char and similar materials now used by sugar refiners to decolorize sugar syrups.

Soft curd milk is now produced by reducing the quantity of calcium and phosphorus in milk; ice cream and ice cream mixes are subjected to the same treatment in order to prevent crystallization; and stabilizers for ice cream are prepared by converting insoluble acid caseinate to soluble alkali metal caseinate. The ion exchange process is also used in the treatment of wheys from which lactose is to be recovered, in removing calcium from milk so that the milk will not curdle during evaporation, and in the manufacture of dried cream products.

Tartrates are recovered from grape wastes by an ion exchange process; beer is made more palatable by the ion exchange control of water quality; the taste and appearance of carbonated beverages is improved by the same means.

One of the most interesting developments in ion exchange during the past few years has been the application of synthetic resin adsorbents to pharmacy and medicine. Five years ago, ion exchange was first used in the pharmaceutical industry to produce deionized water for washing ampoules and compounding elixirs. Since that time, ion exchange techniques have been successfully employed in the isolation or purification of amino acids, vitamins, alkaloids, enzymes, nucleic acids, and carbohydrates; and have greatly facilitated the commercial production of such therapeutic agents as penicillin and streptomycin.

As Medicinal Reagents

The use of Amberli' exchangers as medicinal reagents in their own right has not escaped the attention of the pharmaceutical chemist. The successful application of a modified weakly-basic exchanger to the treatment of hyperacidity and gastric ulcers is a well-known outgrowth of the biochemist's work.

Other therapeutic applications, still in the laboratory and clinical stage, show promise of developing into effective medicants in the treatment of circulatory disorders, skin infections, intestinal disturbances, and many other of man's "common ailments."

Recently, a novel approach to the study of stomach acid has been made possible by a carboxylic acid exchange resin. The Amberlite is dyed, then ingested. A subsequent urinalysis determines how much of the dye has been exchanged for hydrochloric acid in the stomach.

Other experiments have insured the future of resinous adsorbents in pharmacy and medicine by employing them as artificial kidneys in studies on dogs, as a means of "softening" blood so that it can be stored, in the study of blood proteins and antibodies, and for reducing heartburn during pregnancy.

Recovery of Metals

Present in concentrations so low that ordinary methods of recovery are more costly than the value of the metals lost, thousands of tons of copper, zinc, silver and similar metals are discarded as industrial wastes every year in the United States. The resulting pollution of American streams has been one of the tragedies of our age—but will probably remain so only temporarily, since ion exchange resins are now being tested on a very large scale for the recovery of metals from such wastes. In the same general field of activity, ion exchange resins were employed quite successfully by workers on the Atomic Bomb Project (Manhattan District) to separate the rare earth series of metals, and some research workers have claimed that any pair of elements known may now be separated by the proper application of ion exchange techniques.

Models Make Money

A case history showing how designs can be tested and improved before money is spent on molds

EVERY molder worth his salt is fully aware of the many advantages which accrue to him when he has a full-size working model produced before the mold design for the projected part is undertaken. Proprietary molders generally take advantage of this safeguard. However, the custom molder is prone to skip this important detail for a very good reason. The customer must be sold on the idea that such a step is necessary, even though it may cost one or two hundred dollars extra.

Faced with competitive bidding on the over-all cost of the job, this added sum may be the difference between a low bid and a losing one. The molder knows that once the job has been lost to a competitor there is little, if any, chance of his regaining it, even though the successful bidder may run into trouble before production begins—trouble which may cost his customer far more than the model would have cost. Because of this situation, the decision to agree with his customer that the model expense is not necessary is all too often taken by the molder.

The following case history should be an object lesson to both molders and prospective buyers that the cheap way is often the more expensive.

A. J. Desimone Corp., Paterson, N. J., was given the job by Walter Wagner Corp., Ridgewood, N. J., of designing and molding a mixer or shaker for frozen concentrated orange juice. The original design was a tall container with almost vertical sides and a domed friction-fit cover.

This container made the mixing of concentrated orange juice simple inasmuch as the house-wife merely needed to pour in the contents of one can of juice and then fill the container with cold water to an indicated level. This eliminated filling the juice can three times with water in order to get the correct mixture. With the cover in place the orange juice could be quickly mixed and aerated merely by shaking the container.

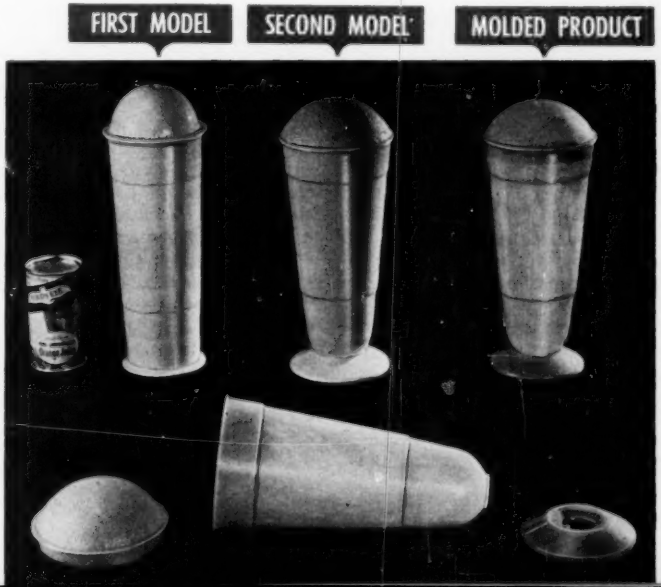
The molder decided that it would be wise to build an exact model before proceeding with construction. Drawings were submitted to Stricker-Brunhuber Corp., New York, N. Y., and a model was built from cellulose acetate (the model at the left in the accompanying photograph).

The model was shown to several large executives who were prospective buyers for this part, and the design immediately met heavy buyer resistance. Although the drawings of this part appeared to be satisfactory, the model quickly showed up an unwielding product with no eye appeal. One of the biggest causes for dissatisfaction was that the part had poor balance. The original designs were promptly scrapped and new drawings made, after which a second full-scale model was again produced in cellulose acetate. This model (shown in the center of the photograph) clearly indicates a much more streamlined part, having much better balance.

When this second model was shown to the same group of buyers, their reaction was satisfactory. The molder then felt it was safe to undertake construction of the molds. A three-cavity combination mold was made, one cavity molding the body, the second the base, and the third a spherical cover or top.

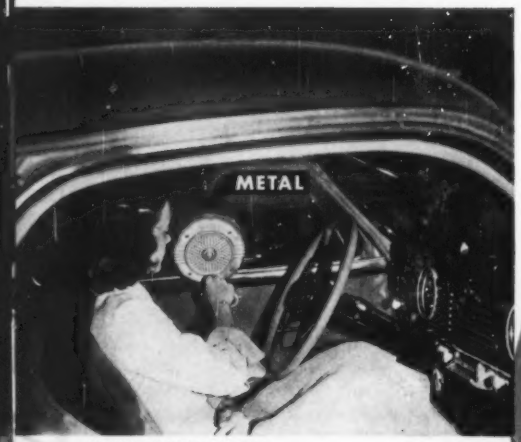
An interesting feature with reference to the mold design for the body is that it is molded in a vertical position with the force plug actuated by a separate hydraulic cylinder mounted on top of the injection machine. It was necessary to mold this part vertically rather than horizontally because the injection equipment available did not have sufficient daylight (mold opening space) so that the force plug could be completely withdrawn and still leave room enough to take the molded part from it.

In its present design, this shaker or mixing container has enjoyed a very satisfactory sale. If the original model had not been produced it is entirely conceivable that the molds would have been completed before buyer resistance was encountered. Under those circumstances, the molds would have been a total loss.



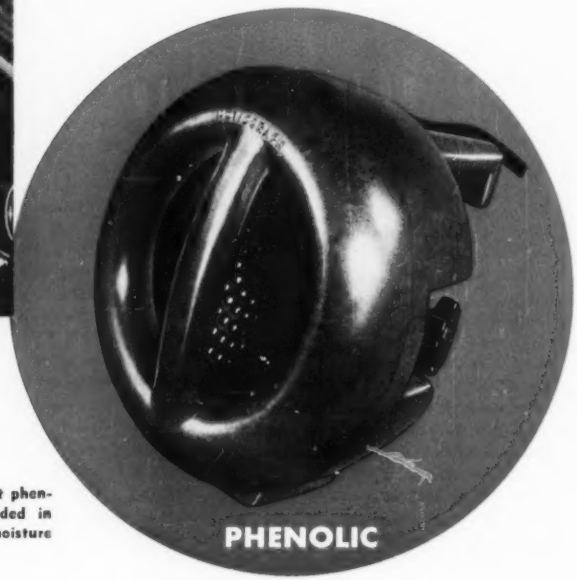
Model at left shows original idea for mixer now molded in three parts

Drive-in Movie



ALL PHOTOS COURTESY MOTIOGRAPH

Old-type speaker, made of sheet aluminum with cadmium or baked-enamel finish, did not have integral front grip for easy handling



In-car speaker housing, made of high-impact phenolic in attractive mahogany color, is molded in two interlocking parts which seal out moisture

IN-car type speakers used in drive-in theater installations lead a tough life under rugged service conditions. These units must not only reproduce the movie sound clearly, with adequate tone range and volume control, but must also endure a wide range of weather conditions and nightly man-handling by the sometimes-careless public. Speaker maintenance alone can become a terrific problem in a theater having several hundred units —particularly if the speakers are made of materials which are inadequate to meet the severe service conditions.

Motiograph, Chicago, Ill., one of the country's leading suppliers of outdoor theater equipment, has had ample opportunity to evaluate numerous materials for speaker housings. As a result of its long experience in the field, this company recently introduced a new-type speaker utilizing a special high-impact phenolic material for the housing. The molded plastic housing has proved far superior to those made of other materials, providing improved performance under all weather and handling conditions and reducing maintenance costs to a minimum. On a direct cost basis, the plastic housings are approximately equal to the metal units which they supersede.

Better than Metals

Because of the great amount of wear to which speaker housings are subjected, the material used in them must be as strong and free as possible from breaking, cracking, warping, or bending. Non-plastic materials which have been used for this purpose include sheet steel, sheet aluminum, and die-cast zinc and aluminum, all of which have proved to have severe limitations.

Although sheet aluminum does not corrode appreciably, it is easily dented and bent, spoiling the appearance of the speaker and making it difficult to take apart for repairs and reassemble. Sheet steel, less subject to denting or bending, has the disadvantage of rusting under outdoor exposure. Die-cast zinc or aluminum housings are not subject to rusting, denting, or bending, but are relatively brittle, tending to crack or break under rough handling.

The extreme toughness of Motiograph's new molded plastic housing is its greatest service virtue. Also, since it is molded in a lustrous mahogany-colored material, no surface finish is required. Various baked-enamel finishes employed on metal housings are prone to chip and crack, usually losing their attractive appearance after the first season. A bright chrome finish, though attractive and serviceable, is undesirable in a drive-in installation because of its high light reflectivity. A cadmium finish over a zinc undercoating is fairly satisfactory, but must be of sufficient thickness to stand up well in service. Some sheet aluminum speakers are used without any finish, but tend to scratch and scale over a period.

Parts Interlock

Attractively designed to protect the 5-in. weatherproof speaker and related components, the Motiograph housing is molded in two interlock-

Speakers Take a Beating

Phenolic housing replaces metal; costs are comparable, results are superior

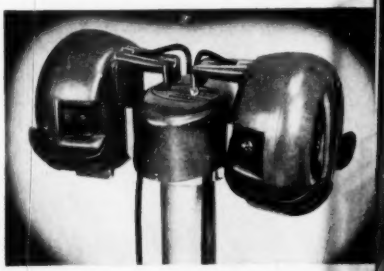
ing parts which seal out moisture and are easily assembled by means of two screws. The larger piece, or rear housing, has an integral support hook by means of which the speaker is fastened to the car window. The speaker wire enters this piece through a groove molded in the top of the support hook. One metal insert is pressed into this casting immediately upon removal from the mold.

The front housing component has an integral handle which provides increased strength and greater ease of handling. This piece is molded with two threaded inserts to engage the assembly screws. Four blind holes cored around the inner lip of the part afford anchorage for speaker unit support pins. Both these components, as well as the junction-box cover which mounts on top of the post standard, are compression molded of Fiberite No. 1053 high-impact phenolic material by Northwestern Plastics Inc., Chicago, Ill.

All molds used are of two-cavity construction. The junction-box covers are run on a 275-ton press, while the speaker-housing molds, which produce one complete housing per cycle, are run on 300-ton presses. The high-impact material is weighed and loaded directly into the mold cavities without preforming. All finishing operations on the parts, including flash removal, drilling of cord hole, and final color buffing, are performed by the molder.

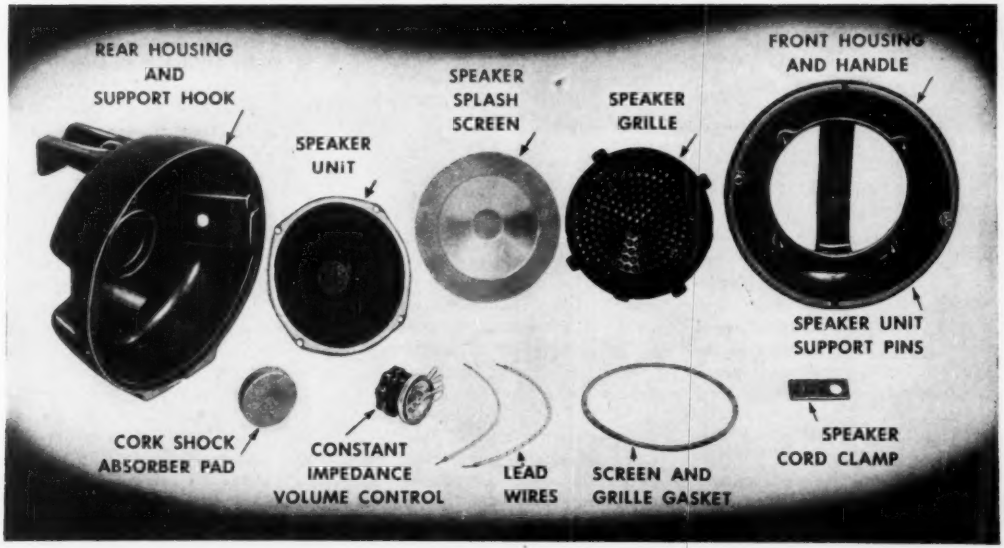
Severe Use Tests

Durability of the plastic housings was amply demonstrated in a series of punishing tests conducted at a drive-in theater. Simulating incidents frequently encountered in actual service, one of the speakers was placed in the loose gravel of the drive-in and a car driven slowly over it; only some minor surface scratches resulted. Next the car was accelerated, pushing the unit ahead of it through the gravel for about 4 feet. The only damage resulting from this test was a small chip from the flange of the handle. Finally, the speaker was deliberately dropped on the concrete base of the post standard from heights of 1, 2, and 4 feet. No breakage resulted from these tests, although they were repeated several times, and the speaker continued to function perfectly without any adjustments or need for repairs.



Speakers, mounted in pairs on post standards, rest in cradles

Speaker components include two phenolic sections for housing. Rear part has groove molded in top of integral support hook through which wire enters. Front part has threaded inserts and blind cores for assembly screws and support pins



EXTRUDING OVER WOOD

Plastic-covered dowels, slats, and handles combine the strength of wood and wear-resistance of plastic

PHOTOS COURTESY TENNESSEE EASTMAN CORP.

All parts of play pen except floor are made of wood covered by extrusion with blue and white butyrate

Wooden rods and handles with variable cross sections can be covered with plastic by new extrusion process

A PROCESS of extruding thermoplastics over wood has been developed by American Plastics Corp., New York, N. Y. The plastic-covered wood parts retain the strength and workability of wood, require no painting or other finishing, are colorful, splinter-proof, scratch-proof, chip-proof, and easy to keep clean.

Wooden dowels, rods, and slats covered with Tenite II cellulose acetate butyrate by the new process are being used in the manufacture of play pens, towel racks, clothes dryers, clothes hangers, and stairway safety gates. The plastic-covered wood, trade-named Aplaco, seems destined to move into many other applications where wood is used but where chipping, scratching, or splintering present problems.

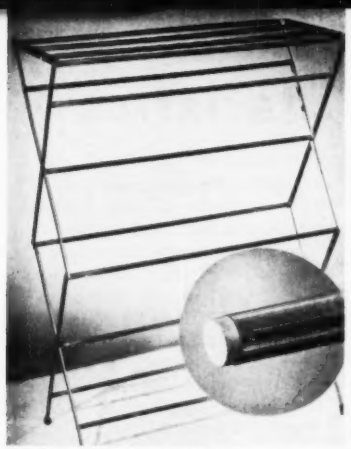
American Plastics has applied for patents on the production process, which was developed in the company's Bainbridge, N. Y., plant. To date, most of the production jobs have been with butyrate and on cross sections of 2½ in. or less. However, other materials have been used and the company is convinced that pieces with larger cross sections can be covered successfully. The plastic covering on most of the production jobs is around 0.008 to 0.010 in. thick, but it can be as thin as 0.004 in. or as thick as 0.030 in., as the application requires. It is also possible to cover pieces of variable cross section, such as brush handles, if the variations are not too great.

Cross-Head Dies

The extrusion work is done in cross-head dies on extruders made by National Rubber Machinery Co., Akron, Ohio, or built by American Plastics for use in the processing of casein, which is the company's primary activity.

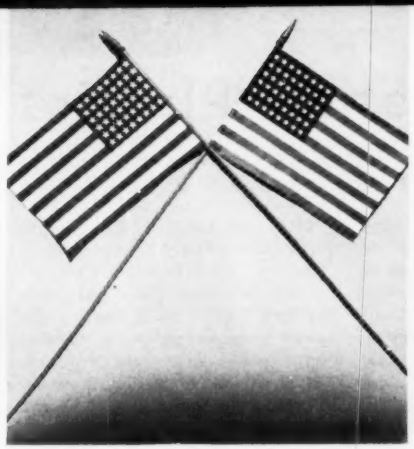
One of the main problems encountered in developing the process was the lack of dimensional uniformity of wood, and the fact that its dimensions are greatly affected by changes in moisture content. Thus it was found necessary to set up a system of pre-drying and dehumidifying the wood stock over which plastic is to be extruded.

The specially prepared wood is fed into the cross head by hand or by automatic equipment. Just before the wood enters the die, it passes through a ring of hot air jets which helps to remove any remaining moisture and to decrease the



COURTESY TENNESSEE EASTMAN CORP.

Hardwood dowels used for clothes dryer bars have serrated butyrate surfaces



Wooden flag staffs have vinyl covering extruded on. Vinyl film flags are heat sealed to staffs

Butyrate-covered slats and molded end caps are used in safety gate

temperature differential between the wood and the plastic.

The wood emerges from the die surrounded by a plastic tube which is larger than the wood, but which shrinks to the size of the wood as soon as it cools. The plastic extrusion is cooled by air blasts. The outside surface of the extrusion can be either smooth or fluted, as in the case of the butyrate extrusion over a $\frac{5}{8}$-in. wood dowel shown below.

Applications

One application of the new Aplaco extrusions is in the play pen made by Oak Hill Co., Fitchburg, Mass. The uprights, slats, and rails are made of hardwood covered with blue and white butyrate to make them tooth-proof. Another similar use of butyrate over wood is in an expansion-type porch or stairway safety gate made by Mapes Woodworking Co., Whitesville, N. Y. The slats in this gate have butyrate end caps which are injection molded by American Plastics.

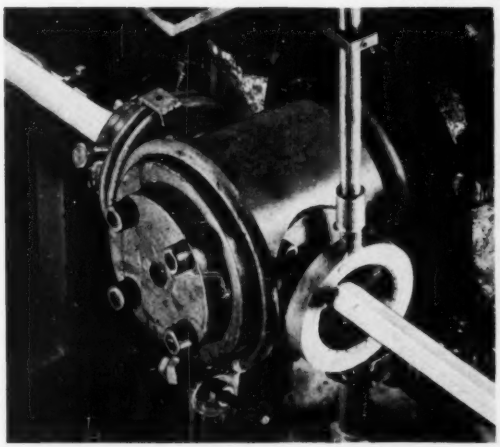
The clothes dryer made by Citation Mfg. Co., Lynbrook, N. Y., has 12 hardwood dowels with serrated butyrate surfaces which are snag-proof and prevent the clothes from slipping off. Similar bars with either smooth or serrated surfaces are used in a towel rack with a bracket and end caps molded of Tenite II by American Plastics. The towel racks are distributed by Topsales Co., New York, N. Y.

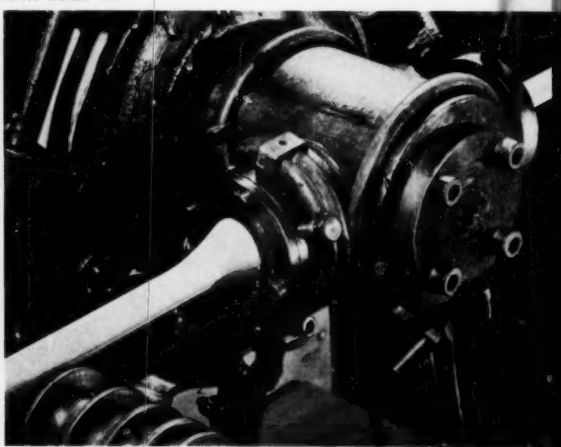
An unusual application is the American flags made by Caris Co., Brooklyn, N. Y. The staffs are wood over which American Plastics has extruded red Geon vinyl. The flags themselves are made of silk-screened vinyl film and are attached to the staffs by heat sealing or by a heat activated adhesive. The finial is injection molded of Tenite II. Thus all visible flag parts are plastic.

Wooden dowel, $\frac{5}{8}$ in. in diameter, is fed into cross head through ring of hot air jets which remove residual moisture

Dowel emerges from extrusion die surrounded by butyrate tube which shrinks to form tight fit. Note serrated outer surface

PHOTOS COURTESY TENNESSEE EASTMAN CORP.





Interpreting Plastics Statistics

THE problem of reconciling all the different statistics in the plastics industry is made self evident by the U. S. Tariff Commission's preliminary annual report on production and sales of plastics and resin materials for 1949. The Tariff Commission now publishes two separate reports on what are essentially the same products. The monthly report, formerly published by the Census Bureau and taken over by the Tariff Commission when the U. S. Government attempted to economize by consolidating or eliminating some of its statistical reports, is designed to give a quick, brief report on what's happening in synthetic resins so that the industry will not have to wait six months or so for production and sales figures. It is naturally subject to error or incomplete information.

The annual report is a much more detailed analysis and is claimed to be more accurate since it gives a chance for adjustment of inaccuracies that may have crept into the monthly reports. Only Table II of this Annual Report which gives classes and uses is reproduced here. Table I, which is a report of synthetic resins grouped according to chemical composition, may be obtained from the Chemical Div., U. S. Tariff Commission, Washington.

The Government labels this annual report as "Plastics and Resin Materials." Consequently, the total number of pounds reported is frequently used as the overall production figure of the "Plastics Industry." This is somewhat misleading since not all synthetic resins are used by what is generally spoken of as the plastics industry. For example, over 455 million lb. of the resins listed in this report are converted into paint, lacquer, and varnish. Furthermore, cellulosic plastics, with a poundage of over 90 million lb. produced in 1949 (exclusive of movie and camera film which is not a publishable figure) are *not* included anywhere in these totals. Another element that should be taken into consideration by any person interested in plastics volume figures is the distinction between "resin content only" and "filled material." Phenolic molding material is now reported with filler in contrast to a few years ago when it was resin only, but phenolic laminating varnishes, etc., are "resin content only." The figures on finished phenolic laminates, another large volume plastic, are not printed.

The figures in the vinyl section add emphasis to this variable factor. The statistics under vinyl in Table II cover all types of vinyl, including saran, butyral, etc., with a total poundage of 302 million. But a part of this total, listed under sheeting and film, includes plasticizer and other fillers. The molding and extrusion figure is listed as resin only, yet extrusion compounds are sometimes 50% plasticizer and filler. MODERN PLASTICS' estimate (Feb. 1950 issue) for all vinyl chloride and copolymer-filled compounds produced in 1949 was more than 300 million pounds. Thus, vinyl chloride compounds alone are equal to the total poundage for all types of vinyls listed by the Tariff Commission.

The styrene derivative polymer and copolymer resins report given here is more complete and somewhat different from the reports listed in the monthly statements—the growing importance of styrene plastics is quite evident from the facts, showing not only a 185 million-lb. production figure for molding materials, but also 18 million lb. for protective coatings, a figure never before published. This material is the styrene-emulsion type used in paper and surface coatings and gives proof to the claims of producers that styrene paint has "caught on" in a big way and has tremendous future possibilities. The 37 million lb. "for miscellaneous uses" likewise points out the growth of the styrene-butadiene type copolymer, chief uses for which up to now are in shoe soles and floor coverings.

REFERENCES TO TABLE ➡

1. Except where noted to the contrary, "Dry basis" for the purpose of this report is defined as the total weight of the plastic or resin material, INCLUDING the weight of resin, plasticizers, extenders, fillers, coloring agents, and stabilizers, but EXCLUDING the weight of solvents, water, and other liquid diluents. Vinyl resins with the exception of sheeting and film, are reported on a resin content basis.

2. Includes data for all synthetic resins, with and without modification, including modifications with rosin and rosin esters, which are derived from phenol, cresols, xylenols, cresylic acid, and other tar acids.

3. Includes data for all rosin modifications with phenolic and other tar-acid condensates.

4. Includes data for synthetic resins derived from urea and melamine and substituted urea and melamine, and modifications of these materials.

5. Includes data for modified and unmodified styrene resins and for styrene-alkyd polyesters.

6. Includes data for polyvinyl halides and copolymers, and polyvinyl acetate, alcohol, butyral, and formal resins. Data for sheeting and film are on a dry basis as defined in reference 1 but other vinyl resin classifications are on the basis of resin content.

7. Includes data for all modifications with rosin, rosin esters, and other materials, except styrene. A moderate quantity of modified alkyd resins was reported for uses other than protective coatings.

8. Includes data for rosin and rosin esters, esterified with glycerol, pentaerythritol, sorbitol, glycols, and other polyhydric alcohols.

9. Includes data for acrylic, aniline formaldehyde, coumarone-indene, petroleum polymer, polyamide (Nylon), polyethylene, silicone, and other synthetic plastics and resin materials.

Note: Statistics on certain classes of resins shown in the Table are not comparable to the cumulative monthly statistics covering the same materials as published by the Tariff Commission for 1949. Statistics on protective coatings are more complete than those given in the monthly reports, and the classification of coating resins under the alkyd resin subgroup is more accurate than in the monthly report.

Synthetic Organic Chemicals: U. S. Production and Sales of Synthetic Plastics and Resin Materials, Grouped According to Classes and Uses, 1949. (Dry basis[1])

Material	Production	Sales
	1000 lb.	1000 lb.
Phenolic and other tar acid resins, total[2]	290,926	249,061
For laminating	39,814	.....
For adhesives	28,615	.....
Molding materials	129,582	.....
For protective coatings, total	40,483	35,219
Unmodified (containing less than 10% modifiers)	17,473	11,946
Modified with rosin, rosin esters, and other materials[3]	23,010	23,273
For miscellaneous uses, including casting	52,432	47,267
Urea and melamine resins, total[4]	134,398	128,784
For adhesives	40,826	43,409
For treatment of textiles and paper	28,736	27,083
For protective coatings	18,669	13,542
For miscellaneous uses, including laminating and molding	46,167	44,750
Styrene and styrene derivative polymer and copolymer resins, total[5]	240,376	228,459
Molding materials	184,834	178,497
For protective coatings	17,880	17,952
For miscellaneous uses	37,662	32,010
Vinyl and vinyl copolymer resins, total[6]	302,222	289,695
Sheeting and film, including safety-glass sheeting	161,076	159,808
For adhesives (resin content)	11,936	11,093
For treatment of textiles and paper (resin content)	29,473	29,654
Molding materials (resin content)	82,187	79,338
For miscellaneous uses (resin content)	17,550	9,802
Alkyd resins:		
Phthalic anhydride resins, total	263,128	135,942
Unmodified, for protective coatings	195,474	86,548
Modified, for protective coatings[7]	67,654	49,394
Polybasic acid resins, except phthalic, total	53,296	42,225
Unmodified, for protective coatings	10,923	8,305
Modified, for protective coatings[7]	42,373	33,920
Rosin modifications, total	55,615	45,377
Rosin adduct resins, for protective coatings	4,750	3,608
Rosin and rosin esters, unmodified, for protective coatings[8]	50,865	41,769
Miscellaneous synthetic plastics and resin materials, total[9]	185,686	177,997
Molding materials	41,751	36,987
For protective coatings	60,139	60,548
For miscellaneous uses	83,796	80,461

Base ring molded of polyethylene is slipped over stock bottle to add a note of color and give bottle the appearance of being a private design

New bottle, injection molded in two parts, is used for a variety of products. Note two types of caps

Injection Molded Squeeze Bottles

ALTHOUGH the first polyethylene squeeze bottles made were produced by blow-molding, bottles made by injection molding have made rapid progress in recent months and are now reaching the market in substantial volume. Like the blow-molded bottles, they are finding an ever-widening field of application as containers for cosmetics, household sprays, etc.

Among the producers of injection molded polyethylene bottles is Injection Molding Co., Kansas City, Mo. Accompanying illustrations show some of the many products now marketed in this company's containers. Among the items shown are a special skin preparation for infants, room deodorants, personal deodorants, cologne, liquid hair dressing, a bird spray which kills lice mites, and a new-type dry-shave powder originally used by hospitals and now being offered to feminine users for painless, effective removal of unwanted hair. This dual-purpose preparation also functions as an anti-perspirant.

The Dri-Sha bottle indicates the design variations obtainable by combining a special base or ring component with a stock bottle. With the cooperation of Edwin Fuerst, prominent Cleveland designer, The Dri-Sha Co. specified a molded polyethylene base ring which is simply slipped down over the bottle, giving it a distinctive appearance and adding an additional color note. The bottle supplier points out that this is an excellent way to modify a stock bottle at modest cost and simulate a private mold design.

The bottles made by Injection Molding Co. are molded in two principal parts—the main body section and the circular base, designed with a groove into which the side wall fits. The base and body of the bottle are welded into a one-piece, leakproof unit by means of a special process, the details of which cannot be released at this time. The separate base section increases the stability of the container and strengthens it at the bottom.

Injection Molding does its own heat-imprinting or hot-stamping of the bottles, using special inks having good adhesion to polyethylene.. The company also uses polyethylene to mold the spray valves and closures which, when combined with an inserted length of polyethylene tubing, complete the bottles. Closures now in production are available in both a globular and a fluted style, and are designed to effect a tight seal on the tapered neck of the containers.

An interesting feature of these bottles is the fact that they lend themselves ideally to re-use. Since the valve assembly is force-fitted into the neck of the bottle, and projects from the top rather than being countersunk, it can be easily withdrawn to permit refilling of the container after the original contents are used up. Capitalizing upon this fact, the company is now placing empty, unprinted bottles on sale in retail drug outlets, for use in spray dispensing of cosmetics and other suitable products in the home. Called the Squeeze Me all-purpose bottle, these containers are labeled with a printed paperboard collar calling attention to their uses.

PLASTICS and DEFENSE

Plastics are vitally affected by a defense program—both because of their great value and utility in production of war materiel and because many of the chemicals from which they are derived are subject to extra heavy demand in emergency periods. The accompanying report on the future prospects for plastics was compiled by MODERN PLASTICS after interviews with plastics and chemical industry executives and government officials.

HOW will the plastics industry be affected in the period of defense preparation which the nation is entering? What, in fact, will happen to our whole national economy during that period? No definite answer is possible, but opinion in Washington appears to be practically 100% unanimous that the United States is at least going on an armed camp basis similar to that in '40 and '41 before Pearl Harbor.

However, there is this great difference in the present national economy: Increased production of military materiel in the '40-'41 defense period required no great expansion of facilities. Industry had been operating at less than capacity level for many years and simply stepped up its operations to meet the military demands. Today the situation is quite different in that most industries are already operating at capacity, and a new 10- or 15-billion dollar military spending program, with priorities granted for defense purchases, must result in a cutback of certain types of goods available for civilian consumption.

Government Allocations Probable

The effect on plastics is by no means clear at this writing. There is far more plastics material and processing equipment available than at any time during World War II, but certain factors pertaining to various types of plastics materials are peculiarly complex and undeterminable. It is expected that the Government will step in and exert allocation control over certain materials that are scarce and are needed for the defense program. However, indications are that there is no intention of "freezing" everything; the present procurement program should not take more than 10 to 20% of the total national productivity.

Iron and steel producers say the program should not take more than 10 or 15% of their output. Consequently, such things as automobiles, refrigerators, washing machines, etc., may continue at a fair production rate although not at the early 1950 peak. Plastics parts will be required for them as usual. Goodly quantities of industrial items and civilian consumer items will be produced as long as the defense program does not become a war program. After all, there were many plastics products on the market throughout the last war, although not nearly as many as people wanted to buy. However, there will have to be some changes made in the plastics used in some consumer products as dictated by supply conditions, and processors will have to use their ingenuity in adapting available materials to the job.

There is bound to be an uncertain period between the present and the time when government orders really begin to roll to industry. This may be anywhere from two to six months hence. Already there have been reports of a molder trying to obtain molding material by ordering the full amount required for a job from all suppliers and claiming that he deserved priority because he wanted the material for a government job. Such tricks are generally found out and only serve to strain future relations between molders and suppliers. An allocation and inventory control program confined to scarce materials only would at least be a deterrent to such tactics and would lead to a more equable distribution of materials.

Complex Problems

The plastics industry's problems in times of national stress are particularly complex because chemicals are a vital part of the over-all defense supply line, and some of them have been scarce since before Korea. Polystyrene is scarce today not only because of an ever increasing demand for the plastic but also because styrene monomer from which the plastic is polymerized goes into GR-S or general-purpose synthetic rubber. Styrene monomer's constituents are benzol and ethylene—and benzol has been scarce ever since the beginning of World War II.*

*See "Benzol—Key to Plastics," MODERN PLASTICS, August 1950, p. 154.

Ethylene, too, presents a supply problem in some localities where there are insufficient facilities for its production, and it can't be transported except in high pressure pipes. However, new facilities are now under construction.

The amount of styrene used for 320,000 tons of GR-S in 1949 was about 165 million pounds. Somewhere around 200 million lb. of styrene is scheduled to be used for rubber in 1950 and about 300 million lb. in 1951. About 390 million lb. of styrene monomer were produced in 1949. In May of 1950 the industry produced 43 million lb., which is at a rate of more than 500 million lb. a year. Estimators say the total annual capacity for the monomer is 550 million pounds. Styrene plastics of all types consumed 212 million lb. of monomer in 1949 and were consuming at an annual rate of almost 300 million lb. in the spring of 1950.

This head-on collision between simultaneously increased demands for rubber and for the styrene plastics disturbed the market. The blame was generally laid on a shortage of benzol, but although benzol is scarce, the seriousness of the situation is probably exaggerated by constant reiteration. Production of benzol in this country should be around 170 million gal. in 1950, which is 10 or 15 million gal. less than needed for estimated use in 1950. As noted below, imported benzol may fill in that gap before the year is over. But as the reader will grasp from the above figures, there will still be styrene monomer available for plastics even when synthetic rubber production goes to and continues at 600,000 tons a year. There probably won't be as much polystyrene available as there was in 1949 or in early 1950 unless additional sources of benzol become available, but remedial measures are being discussed that may result in an improved position, provided the country doesn't actually go to war and provided the synthetic rubber program is not further increased.

Who Will Get Benzol?

If benzol goes under allocation, there will be some battles waged to determine its final use. Ceilings are essential in an allocations system where a certain amount of material is allocated for civilian use by percentages. Take rubber as an example. Under allocations, rubber for tires might be allowed up to 90% of production in '48 or '49. Transportation always gets highest priority in emergencies. But other contestants for styrene needed to make rubber would protest vigorously if rubber for mechanical goods, toys, foam, etc., gets too high a percentage ceiling. That battle would start a cycle of protests reaching into many related fields. Once an allocation system starts, it will spread until every product involved is almost certain to feel the effect.

Here is what's being talked about that affects benzol and styrene:

First most immediate measure has been the reported signing of a contract to import 30 million gal. of benzol from Europe over a year's time. This is mostly motor benzol and will have to be refined, but it will be a help at least. Total production of benzol in this country is not likely to exceed 170 million gal., so the 30 million gal. can be a big factor—could well put us over the hump.

Petroleum companies are now producing a small amount of benzol—somewhere between 6 and 10 million gal. a year. But present facilities are not particularly fitted for the benzol job; plants should be built from the ground up specifically for benzol production, and companies have been loath to make the expenditures necessary because their product would cost more than benzol from coal tar. But surely, since petroleum is the most obvious source for benzol—and since benzol is a prime chemical, without which a war could be lost—the Government will encourage or aid construction of such plants if the need is great enough. It would probably require a year or more to build new plants.

Other sources of benzol such as the hydrogenation process would also require at least a year before they could be tapped on a commercial scale. A hydrogenation plant capable of producing 30,000 barrels a day of synthetic fuel could produce 34 million gal. of benzol a year, but would cost around $240 million to build and equip. The National Security Resources Board has appointed Gaston Du Bois and L. A. Schleuter as consultants in the study of the possibilities of this process.

Less Styrene for Rubber

Perhaps the most promising development that could ease the styrene situation most quickly is the use of less styrene per ton of rubber. The average used in GR-S was reduced from 27 to 23% some time ago and may possibly go to 16 percent.

Unfortunately synthetic rubbers other than GR-S are impractical for rubber-tire casings. Either the materials such as acrylonitrile are even more scarce than those for GR-S, or the rubbers have certain undesirable properties, such as cold cracking. But a new rubber made from polybutadiene that doesn't require styrene at all is moving into prominence. The same processing facilities can be used as with butadiene-styrene, and the material gives promise of excellent cold resistance.

Still another experiment is that of making alpha methyl styrene from toluol and using it in both rubber and plastics. There is enthusiasm for this material in some quarters, but it has already been tried in a high heat-resistant styrene plastic, and developers state the cost is too high.

The situation for polyethylene appears to be much more clear cut than is that for styrene. The evidence implies that there will be very little polyethylene left for civilian products after the defense orders start rolling.

Anvone familiar with the properties of polyethylene knows that it is an ideal material for military uses. Practically every ounce produced during World War II was used for military electronics. This country is now building an $85 million radar warning system that requires a lot of polyethylene. Several hundred thousand miles of infantry assault wire are reported to be on order and every mile requires 14 lb. of polyethylene and 8 lb. of nylon for jacketing. Uses of polyethylene for ordnance purposes will require many thousands of pounds of polyethylene. No imagination at all is required to see that unbreakable polyethylene bottles will be avidly received by the Armed Forces. For packaging, especially of goods going to cold climates, polyethylene will be in great demand for multiwall bags and liners for drums and barrels.

The polyethylene problem is going to be with us, whether or not there is an all-out war, because the mobilization program includes a build-up of supplies that would be available for war, and those supplies are going to require large quantities of polyethylene not only for the products themselves but also for shipping and for protection in storage.

At present there is no indication that the polyethylene produced from additional capacity will not be soaked up by an ever-growing arsenal for defense. Increased polyethylene capacity of substantial quantity will be available at least by midsummer of 1951, and government aid might even speed up that date. One company has been gradually increasing its capacity over a period of months. But government technicians already have their eyes on these increases for possible use by Uncle Sam in the defense program.

Indoil Chemical Co., the chemical sales subsidiary of Standard Oil Co. (Indiana) is known to be operating a pilot plant and furnishing samples of polyethylene, but according to latest information, this is strictly a laboratory experiment unit, and not by any definition a semi-commercial plant. There is as yet no word on how this development may tie into the country's need for polyethylene.

High Capacity for Cellulosics

When styrene plastics started to tighten up, thermoplastic molders turned their attention to cellulose acetate, cellulose acetate butyrate, cellulose propionate, and ethyl cellulose. Production of acetate and butyrate was running over 6 million lb. a month from March through May of 1950 and was reported to be on allocation by various producers by August. The industry produced 8 million lb. in some months during 1947; some estimators claim that total annual production capacity may be as high as 120 million pounds.

There is no indication at present that acetate raw material sources will be highly curtailed by the defense effort. There was considerable shortage of phthalate plasticizers used in cellulosics during World War II, and a material not quite as satisfactory was substituted. Nevertheless, the molding industry used up 5½ million lb. of material per month during many of the war months.

Most of the cellulosic defense products used by the Armed Services are quite similar to civilian applications, with the exception of a few strictly military things such as rocket strips. Tooth brush handles, soap boxes, combs, toilet articles, and the like are typical. Several postwar developments such as butyrate pipe and extrusions over metal may prove highly essential, especially if metal pipe becomes scarce. Various types of cellulosic housings will no doubt be in great demand for both military and civilian use.

The cellulose acetate film situation is discussed in the Plastiscope section, p. 172, of this issue of MODERN PLASTICS.

Look for immediately increased interest in ethyl cellulose, a valuable material for the defense build-up. Everyone knows of its use in the proximity fuse and rocket programs, but because of its toughness, low water absorption, low temperature resistance, and good electrical properties, it has a wide potentiality of use and is under close observation by the Armed Forces for electrical equipment such as jack plugs and similar gadgets; insulation lacquer; dip coats; film, and various other undisclosed possibilities.

Vinyls are Favorable

The situation in vinyls is favorable insofar as material is concerned. Consumption of vinyl chloride and copolymer compounds was only a little over 1 million lb. in 1940; by 1949 it had grown to over 300 million lb. requiring between 175 and 200 million lb. of resin. It is believed that there is enough capacity available to supply at least 100 million lb. more, but it would take several months to get unused facilities into operation and make arrangements for raw material.

There has recently been a chlorine tightness, which resulted in a temporary critical situation for vinyl, but the cause has been largely a long strike which involved 40% of the chlorine industry. A greater danger is a potential shortage of phthalate and phosphate plasticizers which give vinyl its ultimate in desirability. Naphthalene, another coal tar

derivative, is a necessary ingredient for producing phthalates. For the last two years it has been imported from Europe in large quantities—50 million lb. in 1949 and practically the same amount during the first six months in 1950. Whether or not these imports will continue is the question. Oronite Co. in California is now producing phthalic anhydride from petroleum derivatives and presumably could expand if necessary to help the situation. There are many other types of plasticizers that can be used in some applications, but phthalates are basic for all-around performance including amelioration of cold cracking.

The vinyl pattern for the present program will be somewhat different from that in World War II, when most of the plastic went into wire and cable covering for shipboard use. There is not likely to be such huge ship-building activity in the present circumstances. It is true that miles of vinyl-covered wire are used on a big bomber, but even so, bombers are not likely to use as much as ships. Vinyl-coated fabric will be wanted in good quantity for such things as bunk covers on shipboard, tarpaulins, portable airplane hangars, ponchos, and coverings in general, but apparently not for tents. Technicians report that it is too good—makes the tent impervious and causes the interior to "fog up."

Vinyl film will be needed in the defense program for a multitude of small items—packaging, kits of various kinds, gun covers, and what not. Rigid sheet will be used for relief maps. But it is reasonable to believe that this program will not seriously interfere with production of film for civilian purposes unless the shooting spreads beyond Korea. Large quantities of extruded and elastomeric molded vinyl were used for undisclosed purposes in armament in the last war and will be used in even greater quantity in new secret weapons.

Phenolic Consumption Up

No more positive indication of what will happen to the phenolic branch of the industry during the coming months is discernible than can be found in the thermoplastics branch. Phenolic molding material production went to 19 million lb. in March and then held steady at 17 million lb. for the following months. Laminating resins followed a similar trend. The rise in molding powder consumption from around 10 million at the same time in 1949 came from a general increase in manufacture of all types of end products. It is believed the industry could go to 25 million lb. of molding powder monthly, and perhaps more. Thus it would seem to be able to take care of any foreseeable additional orders for defense. But again, benzol is the bugaboo. Benzol is required for phenol. Phenolic moldings and laminates are essential for electrical components and scores of other items required by the Armed Services as well as essential civilian items. About one third of all phenolic molding powder was allocated for essential civilian purposes during World War II: the rest was for military use. But today the production of phenolics is far more than it was during that war, and the military demands are presently much less. Furthermore, such things as electric irons, washers, radio and television cabinets, and electrical fixtures for homes, may be curtailed somewhat in the future, resulting in a corresponding lessened demand for phenolics. It is quite possible, therefore, that the phenolic molding industry will continue on about its present level on either military or civilian orders or both. Industrial laminates should increase in volume; even in peace time a good portion of this business is with the Armed Forces. In the last war the laminate industry operated about 90% on essential goods.

Acrylics, saran, melamine, and urea are all in a good supply position as of this date. Increased facilities for production of all of them have been built during and since the war, and the quantity of raw materials needed for their production has grown considerably. Any one of these plastics can probably withstand an increased demand.

Polyester Boom May Come

The polyester resins may start on a mild boom just as soon as the Government starts its purchasing program. The producers will no doubt get the styrene monomer that is necessary, since polyester production can be channelled almost entirely into defense items. A great deal of developmental work has been done with polyester-glass trial orders, and such things as radomes and other aviation parts, panels for housing, small boats, skis, bread boxes, lockers, portable tanks, and a host of other products are in production or in the offing.

Plastics processors would do well to look into the possibilities of the newer plastics, especially the high-heat resistant types. Silicone-glass laminates are a particular favorite of the Navy. The silicones, together with the fluorocarbons (Teflon and Kel-F) are particularly adaptable for use in many secret weapons, and the Armed Forces may soon be looking for capable processors of these materials. The new alkyd molding compounds may also prove highly acceptable because of their electrical properties. The phenolic-rubber compounds, styrene-butadiene copolymers, styrene-acrylonitrile materials, and vinyl-acrylonitrile combinations all have possibilities that may prove interesting to the military as well as to civilian users who are compelled to look around for material to use in place of something that has become difficult to obtain.

Embossing Upgrades Vinyl

New techniques, some involving printing, give the vinyls new openings in the drapery and upholstery fields

THE already tremendous markets for vinyl have been greatly enlarged by new developments in the art of embossing which make possible the production of vinyl film and sheeting with the appearance and feel of expensive woven fabrics. Various embossing techniques, sometimes combined with printing, are used, but all of them are so secret that the companies involved will not even describe their processes in general terms.

The embossed vinyl materials recently introduced

Plastron, Inc., New York, N. Y., is now manufacturing a line of embossed Ultron drapery fabrics. The material is between 6 and 6½ gage and is specially compounded to achieve the hand and drape so important in drapery fabrics. The material is available in translucent white for "glass curtains" and in six opaque decorator colors.

The patterns, all available in both yard goods and ready-made drapes, are an all-over diamond pattern called Jewel (above), a floral pattern called Corsage, bold satin stripes, and an all-over Chinese scenic pattern.

The material has also been used as a wall covering material, as in the girl's bedroom shown (above, right).

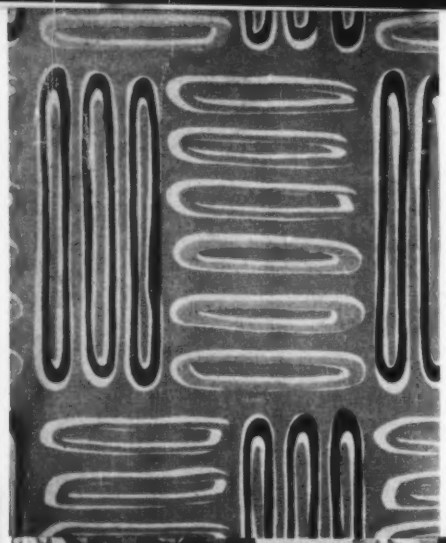
Imperial Chemical & Plastics Corp., New York, N. Y., is producing unsupported Texturized vinyl materials in 4, 12, and 20 gages. Imperial's most unusual pattern is an embossed floral pattern which is treated with gold or silver inks to give the appearance of a rich brocade with gold or silver threads in it.

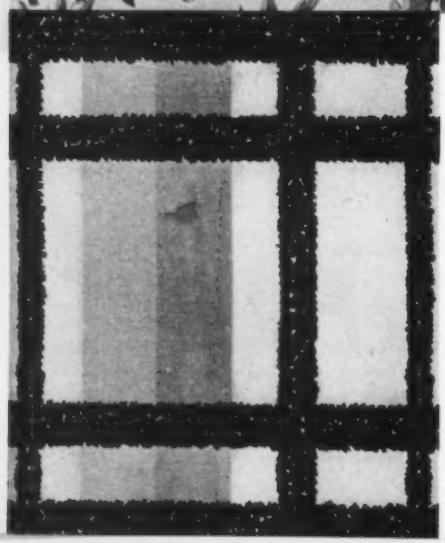
The Sunburst pattern (shown on the chair, right) is printed in gold and silver, then embossed with a satin finish. Printing and embossing are also used in a number of other Imperial patterns.

on the market by four different companies are illustrated on these pages. The embossed Velon made by Firestone Plastics Co., Pottstown, Pa., is embossed on the calender. The other three materials are embossed after calendering.

The results of the new embossing techniques, however secret, are obvious: vinyl film and sheeting, endowed with new beauty and richness of appearance, are now successfully competing with conventional fabrics in segments of the upholstery and drapery fields which plastic materials could never enter before.

In home upholstery, vinyl sheeting with a leather-like appearance appealed to consumers who wanted

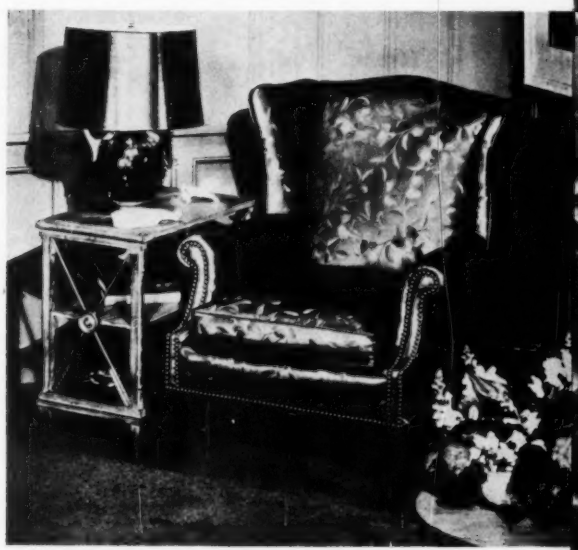




Cohn-Hall-Marx Co., New York, N. Y., has recently added a number of embossed patterns to its line of Comark plastic fabrics. In these fabrics, only the texture is embossed into the vinyl. The multi-colored patterns are printed on. Comark embossed patterns are available in 12- and 16-gage unsupported sheeting and in fabric-supported material. A floral pattern called Pembroke is shown on the chair (above) and in the close-up (center, left).

the appearance of leather or who wanted a long-lasting material for dinettes, kitchens, recreation rooms, etc. The fabric look and the fabric feel had to be added before vinyl could gain acceptance for use in more formal pieces.

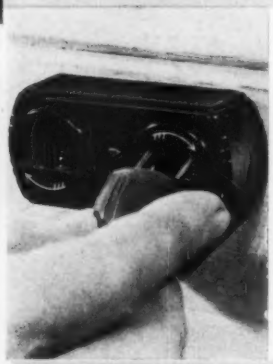
In draperies, thin vinyl film which reminded the consumer of a shower curtain material could compete only with paper drapes and other cheap materials. But 6-gage Ultron with an embossed taffeta-like texture is now competing with more expensive material for drapes and with sheer translucent "glass curtains." This new drapery material is produced by Plastron, Inc., New York, N. Y.



Firestone Plastics Co., Pottstown, Pa., is producing a variety of embossed patterns in its Velon material. The Florelle pattern (shown on the chair above and in the close-up at center, right) was the first pattern introduced, and is now available in both film and sheeting. It is produced by embossing multi-directional lines and then applying ink and coating to bring out the highlights and produce a tone-on-tone effect.

Other patterns available in film include Moire, Faille, Pique, Shadow Stripe, Taffeta, Herringbone (bottom, right), Shantung, and Aztec (top, right). Other patterns in 12- and 20-gage Velon Flex are Windsor Crush, Chevron, Skiver, and Trellise.

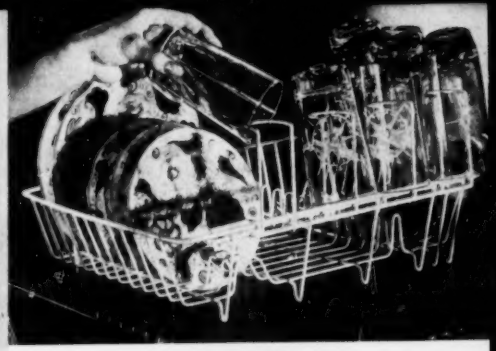
Left—A vibrator, massager, and vacuum cleaner for the hair are combined in the HairVac, which has a housing of heat resistant Lumarith cellulose acetate. The machine contains a rubber brush with short fingers which vibrate at a high rate of speed. This action stimulates the scalp and loosens dirt and dandruff. The vacuum then draws the loosened material into a disposable filter. HairVac operates on AC, and comes with 100 filters. Cowan & Boyden Corp., 50 Aleppo St., Providence, R. I., molds the cellulose acetate housing. HairVac, 813 N. Kansas Ave., Topeka, Kan., is the manufacturer



Above—Wall outlet molded of Bakelite phenolic has rotating caps which protect children against shocks and burns. When plug prongs are inserted, the cap must be turned clockwise before the plug prongs can make contact. When plug is withdrawn, the cap springs back and acts as a cover for the contacts. Bell Electric Co., 1844 W. 21 St., Chicago, Ill.

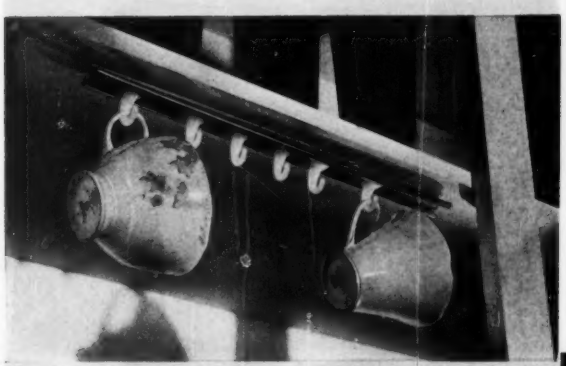
Left—Training chair has seat, tray, and chamber molded of Tenite I cellulose acetate. Back of the chair folds down over seat to convert the chair into a step to enable the child to reach the wash basin easily. The tray and chamber are removable; the one-piece seat, with molded-in deflector, is permanently attached to the frame. All acetate parts of the chair are easily washable and are free of dirt-catching cracks, crevices, or seams. The plastic parts are molded by Michigan Plastic Products, Inc., Grand Haven, Mich. The Step-Up Chair is manufactured by The Lobdell-Emery Mfg. Co., Alma, Mich.

Plastics Products



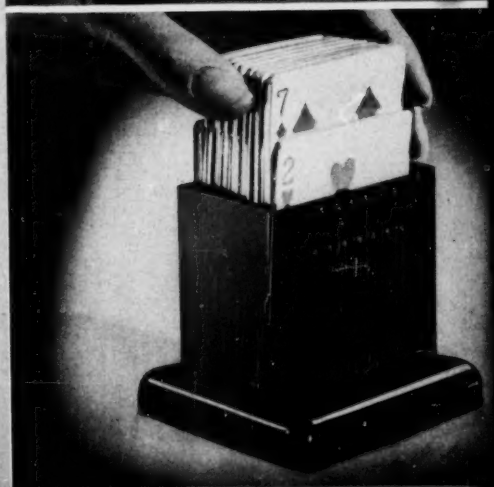
Right—New type dish drainer made of Vinylite resin-coated wire has an attachment for draining eight glasses or cups. The drainer is 16¾ in. long, 13½ in. wide, and 7¼ in. high. It has 12 plate holders and an extra space between the plates and the flatware rack. The vinyl-resin coating outlasts conventional finishes and provides a cushion against breakage of dishes or glassware. The dish-glass drainer is manufactured by Artistic Wire Products Co., Inc., E. Hampton, Conn.

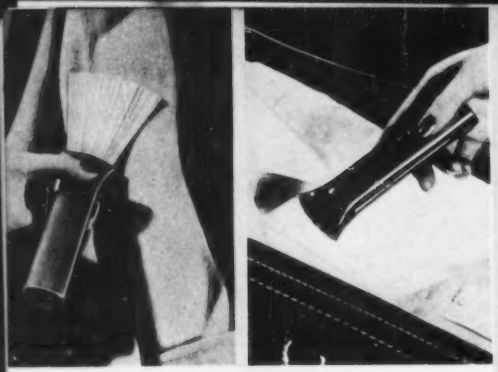
Below—TrackHook set consists of 12-in. long stainless steel track and six sturdy hooks molded of nylon. The track can be mounted on the underside of shelves to hold cups or small utensils, or can be mounted on the wall. The square bases of the hooks slide freely in the track. Chicago Die Mold Mfg. Co., 4001 Wrightwood Ave., Chicago, Ill., molds the hooks for Culver Products Co., 332 S. Michigan Ave., Chicago, Ill.



Right—Handy screw starter has handle molded of nylon. Metal unit attached to the handle grips the screw head firmly so that the screw can be started easily with one hand in hard-to-reach corners. Once the screw is set, the grip of the screw starter is automatically released as the handle is turned clockwise. United Plastics Industries, Vassar, Mich., molds the handles for Aircraft Specialties, Inc., Lapeer, Mich.

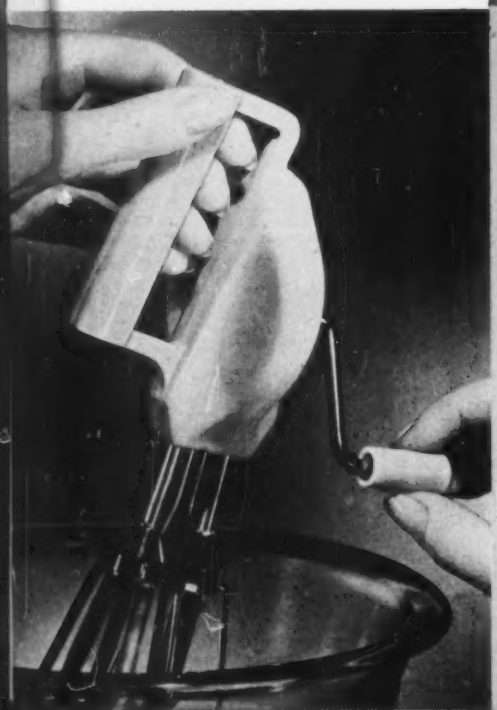
Right—The Shuffle-Cut, molded of Tenite II cellulose acetate butyrate, simplifies the task of shuffling two decks of cards at once, as is necessary when playing Canasta. The two-deck stack is simply placed in the Shuffle-Cut, which is then shaken until the cards assume alternate up-and-down positions. The upper and lower stacks are then removed separately and one is placed on top of the other. Molded-in plastic ridges accomplish the separation. Federal Tool Corp., 3600 West Pratt Blvd., Chicago, Ill., molds the Shuffle-Cut, which is marketed by Lea Industries, 1007 Madison St., Oak Park, Ill.





Left—Telescopic whisk broom is easily adapted to different jobs. It serves as a clothes brush when bristles are pushed all the way out, can be stored easily when they are retracted. Intermediate positions give the bristles the necessary stiffness to serve as a suede brush or upholstery brush. Handle and bristles are both made of Bakelite styrene. Handle is molded by Park Plastics Co., Linden, N. J. The brush is made by Emenee Industries, Inc., 200 Fifth Ave., New York, N. Y.

Plastics Products

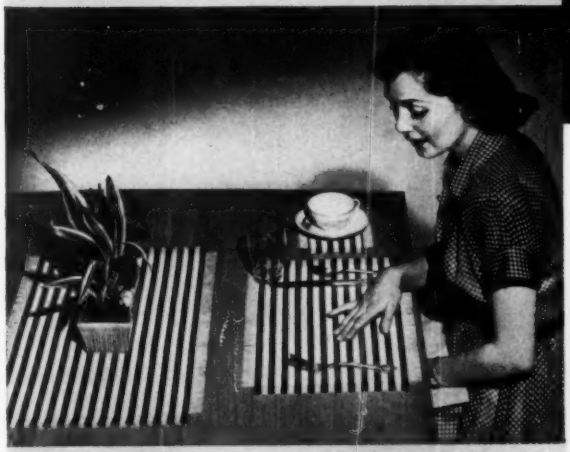


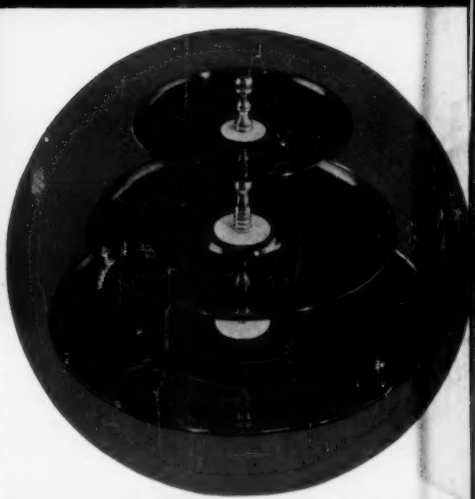
Above—Two-quart container molded of styrene can be used for mixing or storing frozen fruit juices and other liquids. The main part of the container is molded in one opaque piece. The lid, which is transparent, has a molded-in pouring spout and a separate friction closure with a lever attached to it for easy opening. The entire top is removable, thus making it easy to wash out the container. The containers are made by Vogue Mfg. Co., Inc., 98th St. & 103rd Ave., Ozone Park, N.Y.

Left—Newly redesigned Maynard Super Mixer has lateral position handle and gear casing molded of Tenite II cellulose acetate butyrate. The tight-fitting casing, molded in two halves and joined with solvent cement, protects the gears from liquids and food particles. The lateral-position handle is easy to grip and easy to keep clean. Rexford Plastics, Inc., Van Nuys, Calif., molds the butyrate parts for Maynard Mfg. Co., 1536 E. Colorado Blvd., Glendale, Calif., which makes the mixer

Right—Kolor Chew, an all-plastic teething ring, is made of polyethylene. Six molded tabs are snapped in place on the molded ring to make a teething toy which is soft and chewy, but unbreakable. The toy is sold under the guarantee: "All plastic parts unconditionally guaranteed not to break." Made by Kusan, Inc., 2716 Franklin Rd., Nashville, Tenn.

Below—Colorful, stain-proof table mats are made of Lumite woven saran. They can be cleaned with a damp cloth and never need laundering. The mats are available in solid tones of coral, forest, chocolate, and pearl and in white stripes on citron, coral, and chocolate. The woven saran material is made by Lumite Div., Chicopee Mfg. Corp., 47 Worth St., New York, N. Y. The place mats are distributed by Studio House, 653-L Washington St., Greenwich Village 14, New York





Right—Three-tiered tray made of styrene has a molded-in wood grain which resembles mahogany, walnut, or maple. The flow of the material is carefully controlled in the molding operation so as to give a wood-grain effect instead of a marbelized effect or a random mottle. The tray is 11 in. high and 13½ in. in diameter, and disassembles easily for storage. Produced by The Gailstyn Co., Inc., 1150 B'way., New York, N. Y.

Right—Sandals, molded in one piece of Bakelite polyethylene, cannot come apart. They are warm to the touch, scuff proof, water-resistant, and dry instantly after use. Molded-in grooves on the soles prevent slipping. Flexibility of the material permits folding the sandals for storage. Available in four colors in sizes for men, women, and children. Made by Trylyn Mfg. Co., 57 Post St., San Francisco 4, Calif.

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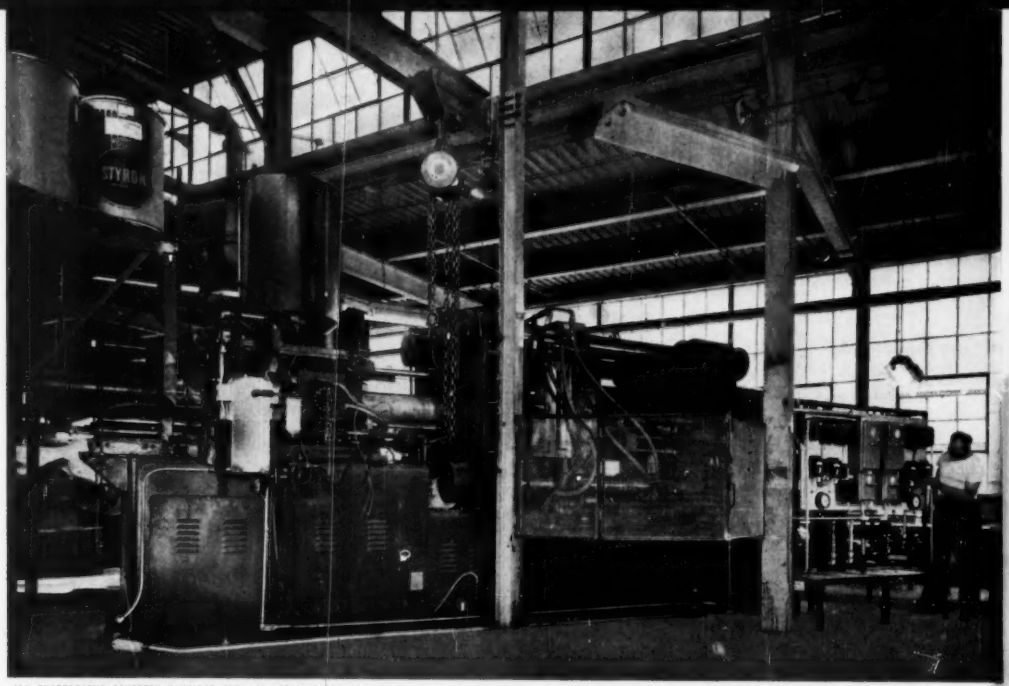


ALL PHOTOGRAPHS COURTESY PANELYTE DIV., ST. REGIS PAPER CO.

Over-all view of the Watson-Stillman machine which, with alterations in die area and heating cylinder, is producing large refrigerator breaker frames weighing over 3 pounds. Dimensions of the frame are 27 by 56 inches

One-Piece Freezer Breaker Frame

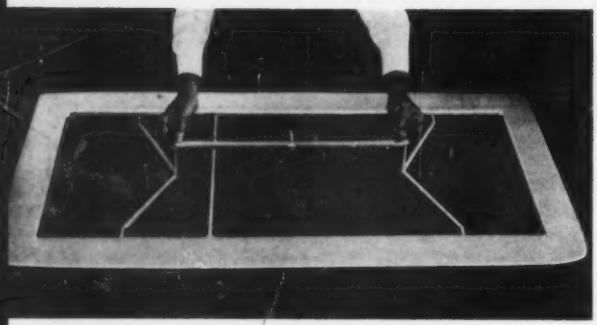
How the problems of molding a large-area refrigerator part were solved. Details of the three-plate mold used

by ROBERT W. BARBER†

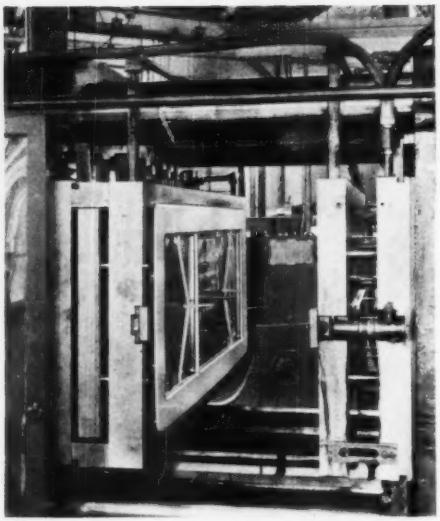
A ONE-PIECE breaker frame which is believed to have the largest outside dimensions of any injection molding ever produced, is now being made for one of the 1951-model Crosley home freezers. Before the piece could be produced, interesting problems of gating, mold design, and temperature control had to be solved. The solution of these problems is one of the first fruits of a long research and development program undertaken by the molder, the Panelyte Div., St. Regis Paper Co., New York, N. Y.

Panelyte, which has long been one of the largest suppliers of laminated phenolic parts to the refrigeration industry, has recognized not only its opportunities, but its responsibilities as a supplier. During the post-war period, an extensive research and development program was inaugurated to explore methods of molding and fabricating thermoplastic parts. This program was aimed specifically toward the development of items for the refrigeration industry with particular emphasis on the production of large pieces. Extrusion, sheet forming,

*Reg. U. S. Pat. Office.
†See page 99.



Hand-held primary sprue and runner unit is tilted to show restricted gates. Material reaches piece through four gates



Right—Open mold with piece still in place. Broken-off main sprue and runner can be seen between mold plates at right

and compression molding were explored as well as injection molding.

Results obtained throughout the industry strongly suggested injection molding as a preferred method of production. However, it was only when this general opinion was substantiated by experimental data and economic studies that Panelyte decided to concentrate on injection molding methods.

In exploring the various problems of molding, it became increasingly obvious that injection molding had developed somewhat more as an art than as a science. Thus there were little data available on technical control of manufacturing processes. This technical approach is essential if large pieces are to be molded successfully because problems of strength, dimensional accuracy, dimensional stability, and freedom from warpage are greatly magnified in such pieces.

As a result of the development program, Panelyte decided to establish an injection molding department. A modern building in Trenton, N. J., was supplied to house the department, and no money was spared in procuring equipment specifically designed to give optimum performance.

The large breaker frame was among the first jobs undertaken after the completion of the initial installation of the manufacturing equipment. This part was made for the Crosley Div., Avco Mfg. Corp.

Crosley engineers, in designing the new line of freezers, felt that a breaker-strip construction consisting of a single piece was practically a must. They also wanted to eliminate all joints in the frame and required that the surface be free of screws or other fasteners. Thus the breaker had to be made in one piece, and it was also necessary to incorporate blind fastening devices in the form of lugs molded on the back. In addition, the freezer on which this frame was to be used has two separate compartments, and the breaker frame thus had to have a cross bar to cover the joint between the two interior compartments.

The requirements of the application are such that the part is subject to considerable abuse in service. This, plus the need for good color and good finish, indicated the use of a high-impact styrene material. Dow 475 copolymer material was selected.

The finished molding weighs slightly over 3 lb. and has an overall size of 27 by 56 inches. This large size, combined with the complication of the crossbar, places the part in the classification of a difficult molding.

A number of new and interesting problems were presented both in designing the mold and setting up the equipment for the manufacture of the parts. The usual procedure to be followed in building a mold for a large frame-like piece, is to have the sprue enter through the center of the mold and feed several runners, frequently arranged in the form of an X or cross. In this case, the use of an X-shaped runner system was not feasible because it would have interfered with the crossbar. Unfortunately, the location of the crossbar precluded the possibility of using it as a runner.

Gate Problem Solved

The problem was solved by the utilization of a three-plate mold incorporating a rather novel system of primary and secondary runners. This system makes use of edge gates at the parting line. It was not considered feasible to gate directly into the back of the piece on account of interference with the ejector mechanism.

This runner system was developed as follows: A special long nozzle was built for the machine in order to reduce the sprue length. The primary sprue feeds into two main runners which were machined into the sprue plate. These runners extend from the primary sprue to

a distance approximately half-way to either end of the mold, and in turn feed through restricted gates into two intermediate sprues. These intermediate sprues extend through the middle plate. Each, in turn, feeds into a pair of secondary runners. The secondary runners feed into the molded piece through restricted gates. There are four gates.

It was not feasible for the operator to reach to the center to pull the sprue by hand because of the large size of the mold. Thus it was necessary to devise mechanical means of pulling both the primary and secondary sprues. The main sprue puller was in the form of the conventional diamond-pointed pin extending through the middle plate. The secondary sprue pullers were in the form of reverse tapered cavities which were cleared by means of knockout pins.

Unusual Mold Opening

In order to separate the main sprue from the nozzle, the mold had to open between the middle plate and the sprue plate while the main cavity remained closed. To accomplish this and to insure constant results, a pair of hydraulic jacks was utilized. These were inserted in milled slots so that they were, in effect, between the sprue plate and the floating plate and were connected with the main hydraulic system of the plant. Springs could also have been utilized for this purpose, but the positive action of the hydraulic jacks was preferable.

The first action to take place with the opening of the mold is a parting of the floating and sprue plates. The diamond-pointed sprue puller breaks the main sprue at this point. As the center plate reaches its final point of travel and stops, the main cavity starts to open. At this point the diamond-pointed sprue puller pulls free and the secondary sprues are broken away from the primary runner.

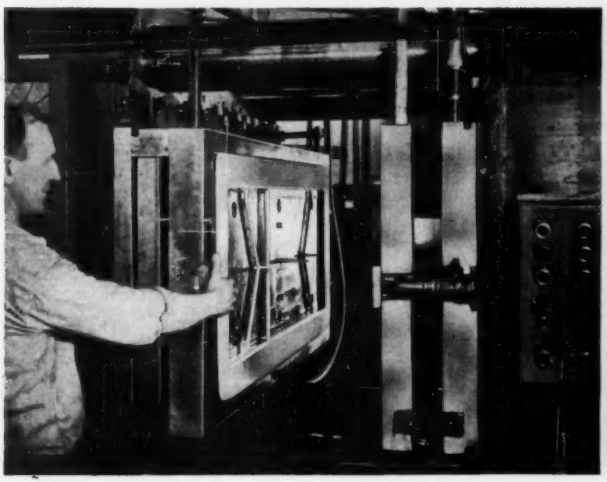
As the mold continues to open, the ejector pins are actuated in the conventional manner, and the piece is removed with the secondary runners attached. The primary sprue and runner falls free or at most requires only the application of a light tap with a rod.

The overall dimensions of the finished mold are 62 by 32 by 14 in., and the mold weighs five tons. It was built by Eagle Tool and Machine Co., Newark, N. J. The problem of building a press of sufficient capacity to handle a mold of this size was presented to The Watson-Stillman Co. The final design was based on its standard 48-oz. machine, but was altered by increasing

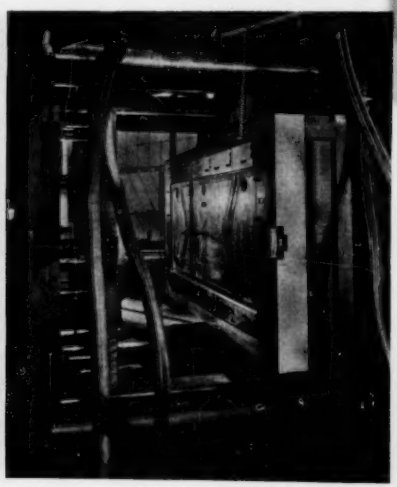
The Author

Robert W. Barber joined the Panelyte Div., St. Regis Paper Co., in 1930. He was named chief engineer in 1937 and has taken an active part in the development of the company's plastics for industrial and refrigeration developments. In November 1949, Mr. Barber was named head of Panelyte's newly formed Advanced Engineering Dept., which is responsible for research and development of new materials and production methods. The custom molded piece described in this article is one of the commercial applications of the work of that department.

The sprue plate and the floating plate of the three-plate mold are at the right; note hydraulic jack which provides positive separation of the plates



Empty mold, showing ejector pins. Diamond-pointed sprue puller is at center of photo



the size of the die area to 40 by 62 in. and incorporating a 60-oz. heating cylinder. The machine was designed with a 1000-ton clamp.

Mold Temperature Control

Another phase of the problem was that of obtaining the best possible finish on the part. The use of four separate gates and the filling of the cross bar resulted in five weld points. The elimination of marks at each of these points called for accurate control of mold temperature. This problem was further complicated by the fact that the styrene copolymer used had to be run with high mold temperatures in order to obtain a good glossy surface.

Fine equipment for the control of die temperatures was on the market, but unfortunately the available units were not big enough to heat a die of this weight properly. Thus a special die-heating system had to be designed and built for the job.

The temperature-control system is a dual unit which is actually two separate units mounted on a single base. One unit controls the temperature of the force plate, the other controls the floating cavity plate and the sprue plate which are connected in series. Each unit consists of three main parts: a fan-cooled radiator, a high-capacity electric water heater, and a high-capacity centrifugal pump. These are connected in series hydraulically in the above order.

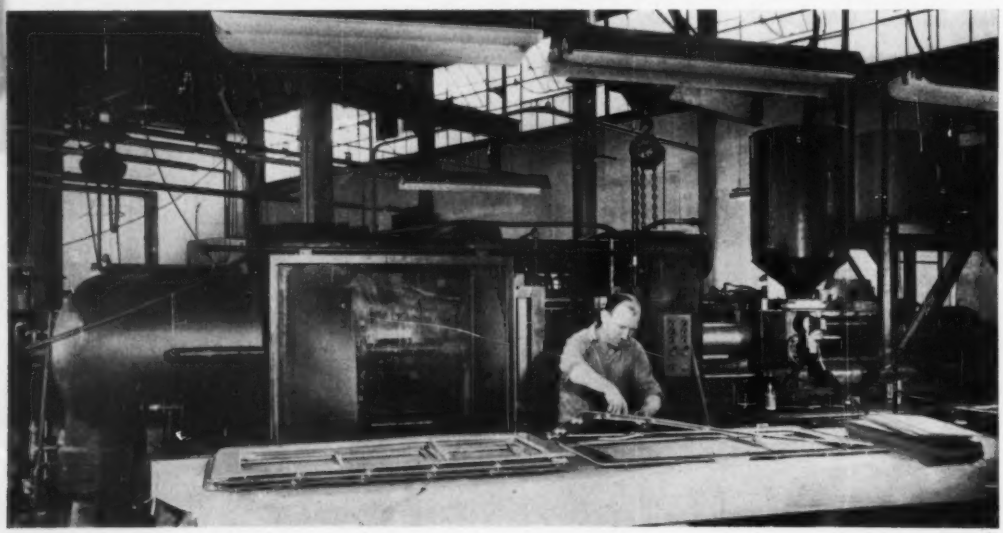
The radiator is equipped with a thermostatically controlled by-pass valve. The fan of the radiator is also controlled by this thermostat, and a second thermostat is used to control the electric heater. The heater thermostat is always set at approximately 5° below the fan control thermostat. In starting up, the electric heater is in operation until the selected operating temperature is reached. Whenever the mold heats beyond the selected temperature, the electric heater is automatically shut off and the fan-cooled radiator comes into play. Conversely, whenever the temperature drops below the selected degree, the radiator shuts off and the electric heater turns on.

With this die-temperature control unit, the die can be brought up to operating temperature in a relatively short time, and each half of the mold can be independently controlled to within 5° F. Thermocouples in the mold and indicating pyrometers, set in line of ready vision, provide a constant check of mold temperature by the operator.

The mold is operated on an overall cycle of 1½ minutes. The full 1000-tons clamp pressure provided by the press is utilized. The injection-speed control is set at full speed, and the injection pressure is held as low as possible consistent with the filling of the mold. The operator cuts the runners from the piece and places it in the cooling fixture where it remains for about 1½ cycles. The piece is then moved on a belt conveyor to the spray booth, where it is removed, sprayed with an anti-static coating (Standard Varnish Works No. 5605) and replaced on the conveyor. It then proceeds to the point of final inspection and packaging.

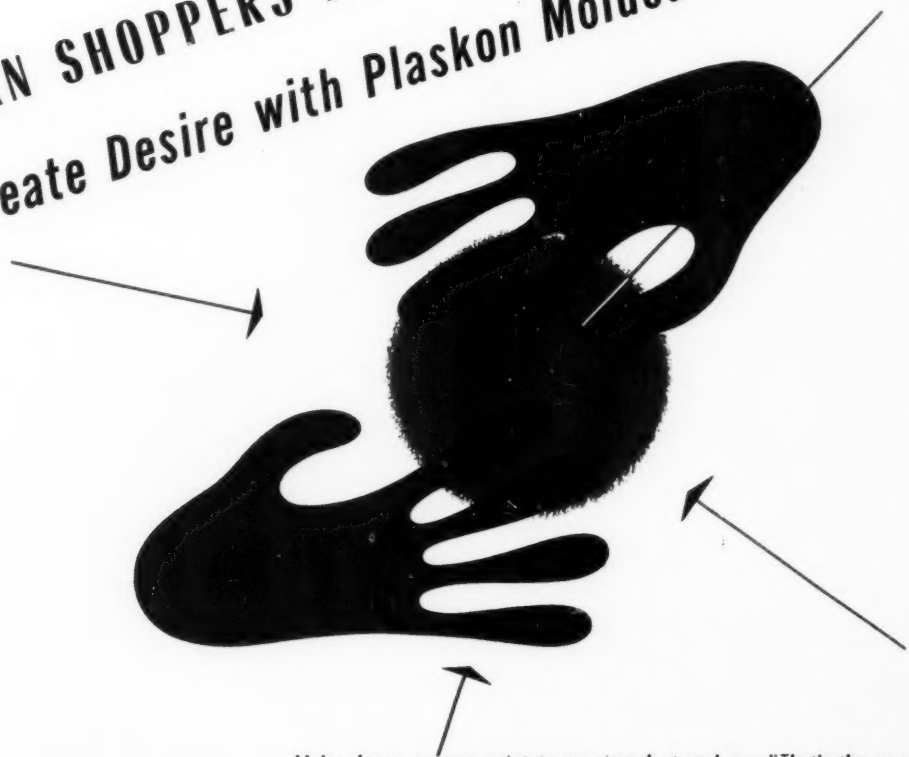
The feasibility of producing pieces as large as the Crosley breaker frame by injection molding is no longer open to question, and even larger pieces undoubtedly will be produced in the near future. However, each piece will have its own peculiar production problems, just as the existence of the cross bar complicated the problem in the case of the Crosley piece. Furthermore, the factors of appearance, performance of the part, and production economics will have to be carefully weighed in each case.

After 3-lb. breaker frame is removed from the mold, operator cuts the secondary runners at the four gate points and places the molded piece on a cooling fixture. Piece is later sprayed with anti-static coating



TURN SHOPPERS INTO BUYERS...

Create Desire with Plaskon Molded Color



Make shoppers stop, point to your product and say, "That's the one I want." Do it with Plaskon Molded Color. Here's a complete scale of striking colors... from white through gay pastels and brilliant hues to jet black. Use them to dramatize the personality of your product .... to make it exciting .... attractive .... desirable. The colors of Plaskon thermosetting molding compounds are permanent and non-fading in use because they are an integral part of the molded piece. Like to try these sales builders? We'll show you how.

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Plaskon Urea and Melamine Molding Compounds are adding sales appeal to Radio Cabinets, Business Machines, Food Equipment, Lighting, Tableware, Stove and Refrigerator Hardware, Wiring Devices, Home Appliances, Closures, Buttons, Cosmetic Packages, Displays, Toilet Seats, Clocks, Dispensers, Premiums, etc.

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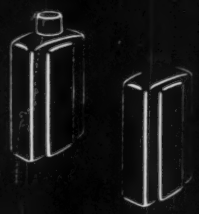
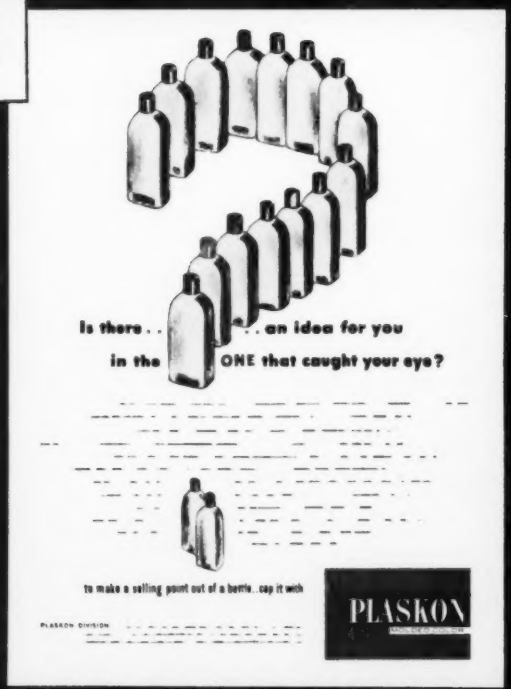
In Canada: Canadian Industries, Ltd., Montreal, P. Q.

#1
ON THE
BOTTLE PARADE
STEPS AHEAD
WITH COLOR
to make a selling point out of a bottle...cap it with
PLASKON DIVISION
PLASKON

HOW TO MAKE A




Is there . . . . an idea for you
in the ONE that caught your eye?
to make a selling point out of a bottle...cap it with
PLASKON DIVISION
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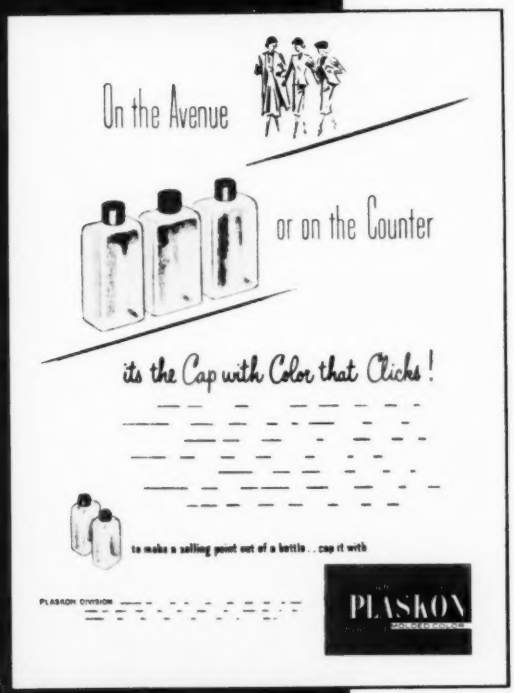
NUMBER 4 IN A SERIES OF
BUSINESS-GETTING CAMPAIGNS TO HELP COMPRESSION
MOLDERS INCREASE SALES IN KEY MARKETS

PACKAGE HELP SELL A PRODUCT


On the Avenue
or on the Counter
its the Cap with Color that Clicks!
to make a selling point out of a bottle . . cap it with
PLASKON DIVISION
PLASKON

Here's more proof that Plaskon's interest in *your* business doesn't stop when you place an order. It's our latest special promotion — this one aimed at selling manufacturers of drugs and cosmetics on the advantages to be gained by employing bottle caps of Plaskon Molded Color. At the left are the preliminary layouts for three ads which will spearhead this closure campaign.

Scheduled to appear in DRUG TRADE NEWS and DRUG AND COSMETIC INDUSTRY, this advertising has been planned to arouse interest and stimulate desire. Direct mail and publicity will be employed to further these ends. Plaskon representatives carrying the story, in person, to the drug and cosmetic industry will complete the "spade work"!

This is the fourth in a series of business-getting campaigns created to expand existing key markets for our molder-customers servicing these markets. There will be more. Watch for them!

PLASKON DIVISION
LIBBEY • OWENS • FORD GLASS CO.
2121 Sylvan Avenue • Toledo 6, Ohio
In Canada: Canadian Industries, Ltd., Montreal, P.Q.
Branch Offices. Boston, Chicago, Los Angeles, New York, Rochester
Manufacturers of Molding Compounds, Resin Glues, Coating Resins

PLASKON
MOLDED COLOR

Mr. Mallory is mighty proud of this coil !

You may get a profitable idea on how to make products better, faster, at less cost using

PLASKON ALKYD

Top part of Mallory Coil for automotive ignition systems is molded of Plaskon Alkyd by Great Lakes Plastics, Plymouth, Mich.

When the president of Detroit's Mallory Electric Corporation brands it "The Best Coil I Ever Made"... you know this automotive coil is something *very special.* And helping to make it such is Plaskon Alkyd, the thermosetting molding compound with electrical properties never before attained in any plastic. Plaskon Alkyd was chosen because it was the plastic material which passed all the tests for dielectric strength, resistance to electrical leakage, arc resistance and dimensional stability under high temperatures.

In addition, *quick-curing* Alkyd can increase your production and reduce costs. It can be molded rapidly on automatic machines utilizing simple dies. Tooling costs are less—up to four times as many parts can be produced per mold cavity. We would welcome your inquiry for literature on how Plaskon Alkyd helps make it better, faster, and at less cost.

PLASKON DIVISION • LIBBEY • OWENS • FORD GLASS CO., 2121 Sylvan Ave., Toledo 6, Ohio

Branch Offices:
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Manufacturers of Molding Compounds, Resin Glues, Coating Resins
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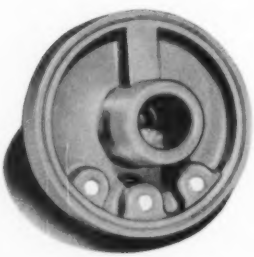


PLASKON
ALKYDS

Printed Sheets Precision Formed

Three-dimensional shapes, with accurate registry of pre-printed details, now produced in fast cycles with low-cost molds

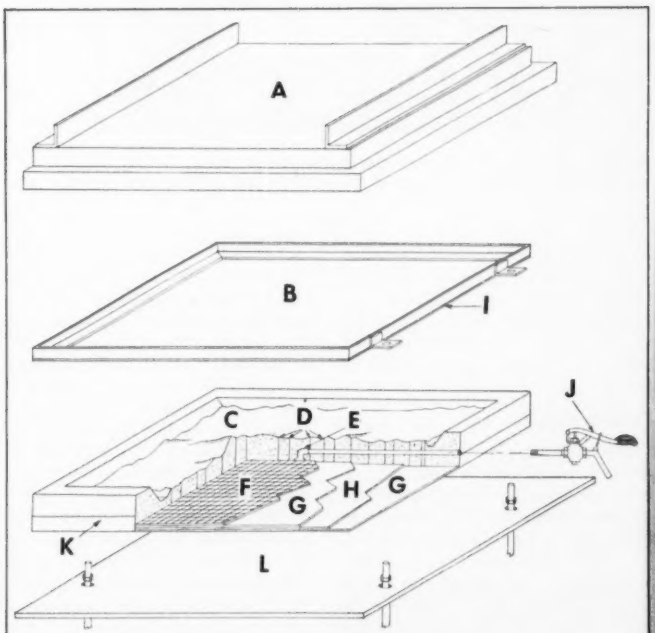
by E. BOWMAN STRATTON, Jr.*

THE technique of producing three-dimensional objects by forming printed flat thermoplastic sheets, while maintaining close registry of the printed information on the formed sheet, is relatively new to the plastics industry. At present, most fabricators decorate sheets after forming by hand painting, screen printing, or spraying. The expense of these finishing operations has limited the use of such formed sheets to articles of high unit cost. Therefore, the development of simple, inexpensive equipment for rapid forming of preprinted plastic sheets into three-dimensional articles should help solve some of the problems which have heretofore discouraged such production.

In the last three years, the Army Map Service, Washington, D. C., has carried on a development program in extension of the original work done in the early 1930's by J. J. Braund, Coast and Geodetic Survey, to determine the feasibility of printing flat maps on thermoplastic sheets and forming them into three-dimensional relief maps.

The resulting economy of relief map production amply justified the expense of the investigation. The exorbitant man-hour cost for hand painting plaster or rubber copies of original models makes quantity reproduction impractical. It was reasonable to expect, therefore, that if flat maps could be printed on thermoplastic sheets and then formed with sufficient accuracy to satisfy military specifications, it would be possible to greatly increase production with a sizable reduction in cost—from a range of $25 to $50 per sq. ft. for hand painting, to much less than $1 per sq. ft. for producing formed plastic copies.

The program has culminated in the production of several thousand plastic maps which have been satisfactory from the standpoint of both economy and product uniformity. The forming process has been sufficiently well tested and proved in production to make possible some definite evaluations of the process. It also seems likely that the materials, equipment, and production methods developed would be adaptable to commercial production. Among the possible non-military applications are: 1) novelties, such

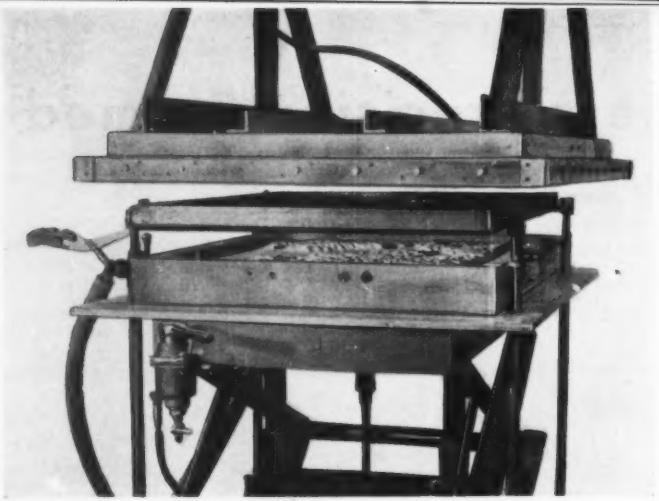


VACUUM FORMING EQUIPMENT

A. Superheater	G. Aluminum Sheet—.032"
B. Angle-Iron Frame	H. Sponge Rubber ¼"-⅜"
C. Mold	I. Sponge Rubber Gasket
D. Vacuum Holes	J. Poppet Valve
E. Vacuum Pipe	K. Heat-Resistant Tape
F. Wire Mesh — 2 Layers	L. Aluminum Plate — ½"

Perspective explosion view shows relationship of the essential components of vacuum-forming equipment for the production of formed thermoplastic sheet

*Chief, Materials Development Section, Relief Map Div., Army Map Service, Corps of Engineers, Washington, D. C.



Lift-type molding table used for forming three-dimensional objects. Superheater is shown above the clamping frame, which is here raised above mold

as wall plaques, illuminated framed wall decorations, hollow toys, and toy components; 2) three-dimensional advertising displays; 3) mannequins and dress forms; 4) containers; 5) lamp shades with raised figures.

Forming Methods

The formed plastic relief maps are produced from flat sheets which are printed in the same manner as the paper maps printed by the Army Map Service. The maps are printed by offset lithography on matte vinyl sheet 0.015 in. thick.

A perfectly formed plastic map would be one on which the flat topographic mapping information is undistorted when molded. The flow and elongation of the plastic sheets during forming with heat and pressure made such precision impossible; however, a high degree of accuracy is possible if heat and pressure are carefully controlled.

Planished vinyl sheet will elongate with the greatest uniformity of thickness if the temperature is raised rapidly and the pressure is applied in a fast surge. In general, the degree of accuracy which has been achieved in forming plastic relief maps will seldom be required for commercial applications.

Considerable experimentation preceded the selection of the heat-forming system now in use. Compression molding would be feasible if low-melting alloy dies could be designed and engineered for rapid heating and chilling. Attempts were made to locate the plastic between the dies and to permit the heat of the dies to soften the sheet prior to molding. Because of the surface variations of the dies, the heat was non-uniform, and many local distortions resulted. Tests were conducted whereby the plastic was heated by sliding a Nichrome wire heating jig between the dies; however, it was not possible to remove the jig and close the press before the plastic became too cool to mold.

Plug molding was found to be slow, cumbersome, and inadequate. Uniform pressure against the male or female die was not possible until the end of the stroke, and in the meantime local printing distortions had been established throughout the sheet. The use of hot air or steam as heat and pressure media is equally unsatisfactory. A surge develops, at the start of the application of hot air or steam, which influences the directional flow of the plastic and causes misregister. In either case, vacuum is required to hold the molding during cooling.

The use of radiant heat and vacuum alone is presently preferred. If the heat is uniform and fast and if the air in the mold cavity can be evacuated at fractional-second speed, high pressures are unnecessary. This method offers many advantages. Because of the low pressure involved, non-metallic molds, which are inexpensive and relatively simple in design, can be used. The formed piece can be cooled by circulating cold water continuously below the mold surface to maintain the surface temperature at 100° F. or cooler. Production speeds are satisfactory in comparison with compression or injection cycles for molds of comparable size. With mechanization of equipment and automatic timer controls, it is possible to produce more than 35 pieces an hr. from a mold approximately 500 sq. in. in size.

Molds

The master model of a relief map is constructed from a flat contour map. Templates representing contours (lines of equal elevation) are cut on a duplicator from cellulose acetate sheets. Each template or sheet represents one contour elevation. The completed templates are stacked and laminated into a step block, and modeling clay is applied to fill and smooth in the surfaces between the steps or contour edges. A plaster negative is made over the master, and the production molds are then made from this negative.

The selection of mold materials is based on these specifications:

1) The material used for the several casting operations between the master model and the production mold must be dimensionally stable. In addition, expansion or contraction during and after setting must be held to a fine tolerance.

2) The mold surface must have good abrasion and heat resistance. Sharp narrow forms tend to erode quickly if the material is deficient in these properties.

3) Structural strength is equally important even though the molding pressures involved are low. The material should provide sufficient impact strength to overcome the weakening effect of enclosed vacuum lines and copper tubing.

Low-expansion plaster has been found to be adequate for short production runs (up to 1000), providing there are no formations with sharp features on the mold. Size control is excellent. Expansion can be held to approximately 0.005 in. in 12 inches. However, progressive erosion of the plaster surface occurs due to abrasion and intermittent heat and cooling.

Oxychloride cement appears to offer the greatest possibilities for this application. After 1000 moldings, no degradation of the surface or loss of structural strength was apparent in the cement mold. The cost of the cement is approximately 5¢ per pound. One difficulty with this material is in machining; the cement contains a high percentage of sand and, therefore, most machining operations are impractical; but careful engineering in the casting of the mold can overcome this.

The design of the mold is predicated on the character of the molding. At present, female molds are not used because, with them, the peaks become deep narrow draws which are the last areas to be formed and, therefore, the greatest printing distortion and thinning of the plastic occurs at these points. In some instances, printing on the peaks will expand five and six times in size, when female molds are used, and the plastic will become so thin that it will collapse unless reinforced.

By using a male or positive mold design, the peaks are formed first with no printing inaccuracies, and the thinning and distortion in the low areas are greatly reduced and of secondary importance. Distortion is measured by printing ⅛-in. grids on flat sheets, forming the sheets, and measuring the distortion of the grids. Draws up to 6 in. have been made without enlarging the grids more than double.

In addition to the depth of draw, distortion is affected by the relation between the width of aperture and the depth of draw. The rule seems to be that printing distortion will not be excessive if the depth of draw is no more than the width of the aperture. For example, a mountain 1 in. high and 1 in. across at the base would cause little distortion in the printing. But a mountain 1 in. high and only ½ in. at the base would cause undue distortion.

The positive mold technique requires a framing wall outside the map area at the same height or slightly above the highest elevation on the mold for locating and registering the flat map. This necessitates the use of about 3 in. of excess vinyl which is later trimmed from the map. Although this surplus material is expensive, the results justify the method in the majority of cases.

The mold is a vital part of the vacuum system. The self-enclosed vacuum system is designed so that there is no stress on the mold, because when the air is evacuated, the atmospheric pressure is equal on the top and bottom surfaces. To accomplish this, vacuum holes throughout the mold are interconnected and tied to a ¾-in. feed pipe embedded in the mold. The vacuum holes to the face of the mold are formed by casting into the mold 6- by 3/32-in. metal pins which are later removed. These pins are tapered at the points to form 0.030-in. diameter holes into which the plastic will not be drawn. Sheets of wire mesh sealed against the back of the mold provide the air passage to the feed pipe.

The number of holes should be such as to assure the evacuation of air in the shortest possible time. The location of the holes is determined with the view of obtaining complete evacuation of air from the mold surface. A typical example of a successful application is a mold for a 360-sq. in. piece with a 0.23-cu. ft. cavity which contained a minimum of 500 holes.

A globe-type quick-action valve is connected to the feed pipe at one side of the mold. Vacuum is supplied by a 2-hp. pump, which is of sufficient capacity to service two map-size molds in alternating use. Occasionally, partial vacuum can be used advantageously to control the sheet during heating, in which case a bleeder or needle valve is employed in conjunction with the globe valve. For best results no vacuum is drawn until the plastic has been heated to the proper molding temperature. To obtain maximum efficiency from the pump, all connecting lines and mold surfaces should be sealed and checked for leaks.

The cooling system can be designed in many ways. Usually in a 24- by 30- by 3-in. mold, ¾-in. copper supply and exit tubes are located outside the map area with ¾-in. copper circulation tubes spaced every 1½-in. just beneath the mold surface. An effort is made to bend the copper tubing so that it will lie no deeper than ¼ to ¾ in. below the surface. Tap water is run constantly through the system at low pressure during forming.

The molding table is a lift type which has been designed to incorporate the clamping frame. The frame is stationary, and the mold is raised until it is brought into adequate contact pressure with it.

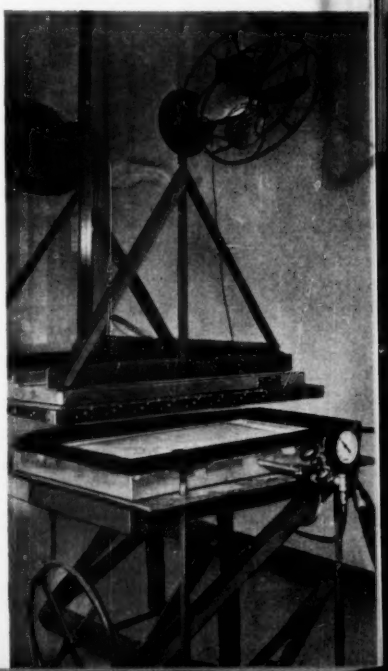
Heat Source

A radiant heater with Fiberglas insulation is the most satisfactory type of equipment from the viewpoint of even heat distribution, speed, and economy of operation. For ease of operation, the heater is mounted on a frame connected to an overhead crane and travels back and forth over the stationary molding table. It is possible to obtain heating cycles of less than 10 sec. if the heater is run continuously at full capacity and is located close to the surface of the plastic sheet during the cycle. However, such speed is difficult to control. Normally, it is sufficient to adjust the heater for 10-sec. cycles.

The precision and constancy of the heating cycle is important because of the chance of overheating or underheating. Too much heat degrades the plastic and causes discoloration and brittleness. Underheating develops excess strains, which will be evidenced by not

(*Continued on p. 110*)

Clamping frame locks plastic sheet in position over the mold



BEETLE® and MELMAC®

Molding Compounds Make Them

STOP! LOOK! LISTEN!

...and BUY!

STOP... BEETLE-molded closures are "stoppers" in more ways than one. BEETLE plastic is chemically inert, unaffected by acetone, alcohol, essential oils. Its *permanently* beautiful colors stop customers, start sales.

LOOK... They can't help looking at products housed in lustrous BEETLE and MELMAC plastics. And they'll keep on looking... with pride... because the beauty of the color is not just skin deep; it goes all the way through. No chip, no fade. Easy to keep clean.

LISTEN... They buy *real* color to listen with when it's in the new-type telephone handsets molded of MELMAC plastic. And that color is as durable as the molded-part itself. Sweat and grime won't stain it... they wipe off readily.

AMERICAN Cyanamid COMPANY

PLASTICS DEPARTMENT

32 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.

Cyanamid looks at

PLASTICS TODAY...

Newest chapter: Reinforced Plastics

FOR THE PAST DECADE the story of progress in plastics has been "stopping" industry.

Latest chapter... concerns polyester reinforcing resins, a comparatively new type of plastic. For very practical reasons, industry is taking a long interested look at polyesters.

They introduce dramatic opportunities for vastly broadened product usefulness... with significantly lowered manufacturing costs... and with increased sales and profits.

Evidence of reinforced polyesters' growth is a development within the plastics industry's own trade association structure. The Reinforced Plastics Division of the Society of the Plastics' Industry has come along fast enough to hold its own separate national conferences. Concerned with a fast-moving field of new application and new-product development, discussions at its meetings focus sharply on practical progress with reinforced plastics... progress made possible by the successful use of polyester resins in an amazing divergency of end-products.

To illustrate:

The page opposite highlights several end-products and reasons why they are best made with LAMINAC®... Cyanamid's polyester reinforcing resin. These examples demonstrate a range of size and shape about as divergent as can be expected from *any* basic material. They range

> ...from a veritable edifice of highly specialized industrial testing equipment (room-high, 35,000 times the size of a baseball... yet only one-fifth the weight of similar equipment made with iron);
> ...to a hardworking commonplace product of totally different shape and comparatively small size; a street-light reflector that takes paint and punishment far more efficiently than other materials traditionally used.

Within the scope of size, shape, and use lies many a proven example of what can be done with resins such as Cyanamid's LAMINAC:

> Fishing rods flexible enough to bend to a complete circle;
> Boat hulls (from dinghies to 36-footers) that resist the breaking force of impact of rocks, the rotting attacks of weather, water, worms and other marine life;
> Aircraft parts... structural or electrical;
> Buttons for frocks, or life-like mannequins with which to sell frocks.

LAMINAC...developed by American Cyanamid Company...is clear, thermosetting, has a wide range of viscosity. It may be used for impregnating glass cloth, glass mat, paper or many other materials to produce such diverse products as listed above. In its cured form, LAMINAC has excellent insulation properties, high chemical and abrasion resistance and great strength. (And color all the way through is easily achieved with LAMINAC pastes that readily incorporate into the basic resin).

Small wonder that the full range of LAMINAC resin end-uses has hardly begun to be explored. But more and more manufacturers are probing its possibilities.

In February, our full-color page (as opposite) illustrated LAMINAC-made tote-boxes for bakery products... an additional end-use shown and described was an outdoor garbage-pail liner.

Within a few days after the advertisement was published, a necktie manufacturer asked us where he could get 5,000 tote-boxes like those shown for handling bakery products. This inquiry was immediately followed by a request for 30,000 of the garbage-pail liners. These, at the time the advertisement appeared, were only an idea on a good end-use for LAMINAC. No such product was being made.

Well-equipped, thoroughly experienced and soundly staffed, all fabricators have the additional advantage of being able to confer with and ask for special research by basic materials suppliers like Cyanamid.

Perhaps your product, your production line, or your idea for a product can be improved and marketed faster as a result of applying to it a polyester resin like LAMINAC. Why not find out? Write to us ...we're ready to help you.

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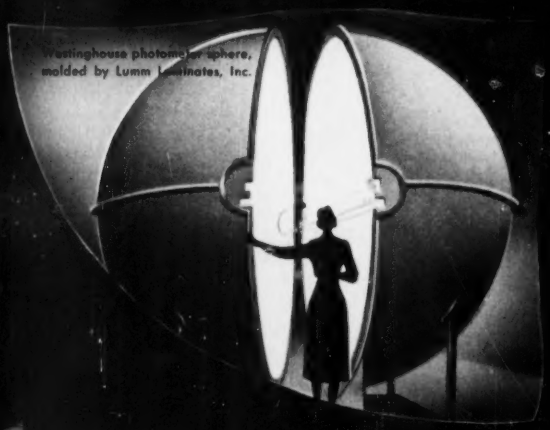
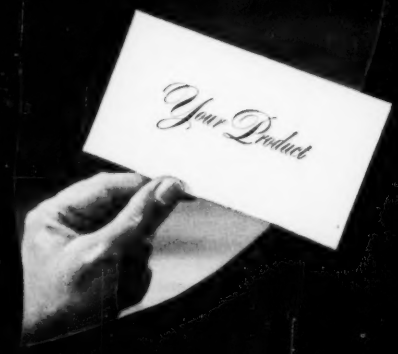


Westinghouse photometer sphere, molded by Lumm Laminates, Inc.



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STRENGTH AND LIGHT... Commercial signs made with LAMINAC Resins are so translucent that *one* electric bulb illuminates them brilliantly. Because of LAMINAC's superior strength, the seller fully guarantees them against breakage under normal use.

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forming over sharp angles, blushing in the high strain areas, and subsequent warping and instability of the piece. As nearly as can be determined, the molding-temperature range of 0.015-in. rigid vinyl sheets is between 275 and 300° F. and that of cellulose acetate is between 300 and 350° F.

Many methods have been tested to insure accurate and consistent registry of the flat printed sheet on the mold. The most satisfactory appears to be the same registry principle used in printing the map, wherein five and six colors are overprinted with a registry tolerance of 0.001 inch. The printing press maintains constant control of the sheet with three guides or grippers at specific locations on two leading edges of the sheet. These three points are transferred to the mold where adjustable 2-in. wide back stops are mounted. Five or six sheets are trial formed at the start of production. By moving the back stops slightly, the optimum sheet location can be established for the duration of the production run.

Method of Forming

The printed sheet is placed against the back stops and the mold is raised to clamping position. The heater is positioned over the mold for approximately 10 seconds. No vacuum is exerted until the end of the heat cycle, at which time a full vacuum surge is exerted and the mold is immediately lowered to release the piece. By mechanizing the operation of the mold table and the heater and by employing automatic time controls on the heat and vacuum, it should be possible to make 40 to 50 pieces per hr. per mold.

The number of rejects has averaged less than 3% based on military analytical standards in 4000 maps. Production costs—including plastic material, printing, molding, and finishing—have been in the neighborhood of 50 to 75¢ per sq. ft. of formed sheet. These costs could be greatly reduced in commercial production with larger volume, less rigid standards, and lower-priced plastic materials.

Final specifications for plastic sheet materials for Army maps have not been determined. At present, 0.015-in. sheets provide sufficient rigidity in non-flexible map applications so that the slight center sag occurring in the wide span of the moldings is not objectionable. Rigid vinyl planished sheets have proved satisfactory in most instances. The low stress level in these materials is evidenced by the fact that printing distortion does not occur during the heating cycle. Improved impact strength at low temperatures is desirable. Problems of post mold dimensional change and warping have not been encountered.

Calendered vinyl, cellulose acetate, cellulose acetate butyrate, ethyl cellulose, and other thermoplastic sheet materials have not yet been fully tested in production. Indications are that registry control in molding these materials will necessitate the use of partial vacuum during the heat cycle to prevent printing distortion; as a result, some sacrifice of elongation uniformity is to be expected.

Polyethylene planished sheets offer advantages of flexibility in a wide temperature range for many map applications. These materials have been tested experimentally but further investigations have been postponed until the printing problems have been solved.

The foregoing comments and descriptions are not intended to be construed as factual data in relation to applications other than molded plastic relief maps. Each commercial application will inevitably offer special problems. It may be of interest to those fabricators who are considering a product which fits into this process to learn that the equipment cost for a two-mold operation of the size discussed here is approximately $2000. Multicavity molds can be used efficiently, depending on the size of the individual piece. The labor and materials necessary for setting up and casting one mold should cost in the neighborhood of $100; however, additional molds can be made for considerably less.

After forming operation is completed, mold and clamping assembly are rolled out from under super-heater, and finished three-dimensional map is removed

Extruder-Compounder

AFTER being in the development stage for several years and thoroughly tested under actual production over a period of 18 months, an extruder manufactured by Mapré S.A., of Diekirch, in the Grand Duchy of Luxembourg, Belgium, has recently been placed on the market. Called the Trudex, this extruder is designed with two meshing screws which revolve in opposite directions.

Like the majority of twin-screw extruders, the Trudex can compound, color, extrude, and pelletize most thermoplastic materials. It is stated that its rated maximum output is approximately 65 lb. per hour.

The square thread engaging worms of the twin screws give a high degree of positive thrust. The screws and the extrusion chamber are parallel throughout their 23.6-in. working length; the external and core diameters of the screws remain constant, the former being 3 in. and the latter 1.65 inches.

The mixing, compounding, kneading, and pumping action becomes progressively more positive from the intake to the output ends of the screws because of a small decrease in clearance between the square threads. At the intake end, the clearance between threads is 0.280 in., and at the output end 0.040 inch.

Trudex Specifications

Total weight	4000 lb.
Required floor space	61½ by 37½ in.
Over-all height, including hopper	63 in.
Capacity of hopper	9 gal. (approx.)
Total power consumption for heating	4500 watts
Motor 1420 r.p.m.	4.75 hp.

Clearance between the outside diameter of the screws and the internal wall of the chamber is uniform at approximately 0.008 inch. There are no abrupt changes in the section or convolutions of the threads and no dead spaces along the screws which might result in an accumulation of material with subsequent decomposition.

At the output ends of the screws, the threads are notched to give a final kneading action to the material and to aid in the elimination of screw pulsation. Extrusion pressure at the head is calculated to be between 4400 and 6600 lb. on its internal face, depending upon the material being handled.

The working surfaces of the screws and chamber are ground from hardened chrome nickel steel with the screws having a greater hardness than the chamber.

The mounting of the screws and chamber is so designed that they can be easily and quickly removed without the aid of mechanical hoists. This permits the extruder to be cleaned with great facility. The thrust of the screws is taken entirely by ball bearings.

This machine is equipped with a stepless variable speed control, having a range from 6 to 27 r.p.m., that can be varied while the machine is in operation. Heat is applied to three equally spaced zones along the length of the extrusion barrel and separately to the die head and die. By means of thermostats inserted in the barrel and die head, coupled with pyrometer controllers, the temperature in each zone can be independently regulated. Each zone has its own dial thermometer on the control panel, together with switches and indicator lights. It is claimed that the sensitivity of this heating system is such that the temperature can be controlled to within plus or minus one degree F.

Pure p.v.c. without plasticizer has been extruded on this machine in the form of 3.15-in. diameter tubes intended for the piping of chemicals. Other extrusions have been successfully produced from nylon, styrene, and cellulose acetate, as well as plasticized p.v.c.

Mechanical and thermal controls are grouped on a central panel

Replacing square thread extruder screws after cleaning the machine

Chamber of machine is easily lifted back into position by two men

Their ounces of strength are a match to the mammoth machine they serve!

●

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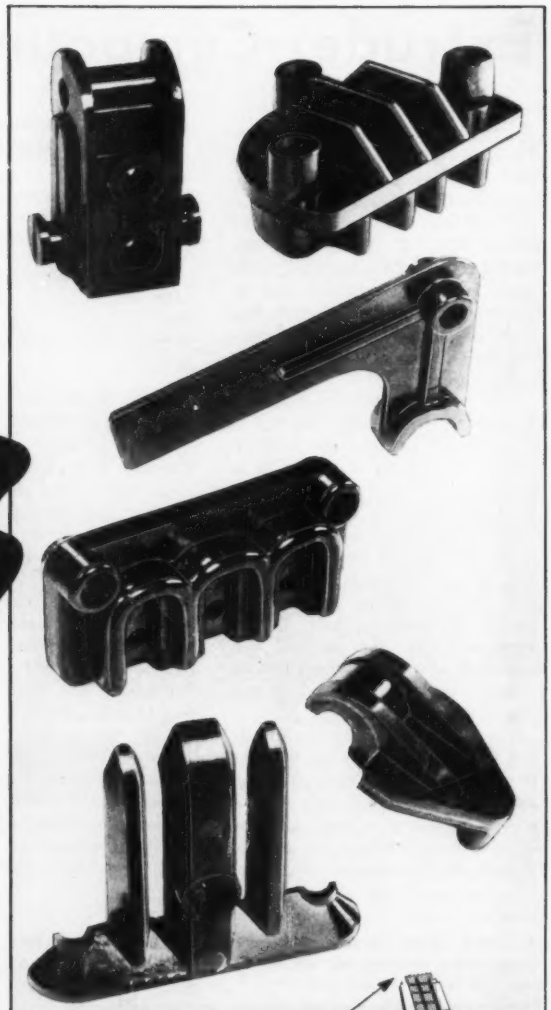

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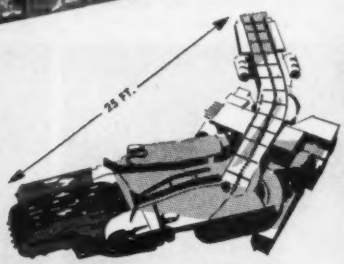

"Thumb nail" rendering of Joy Continuous Miner as developed by Joy Manufacturing Company Pittsburgh, Pa.

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Organic Polyvinyl Ester Production in Germany

by NORBERT PLATZER†

THE German methods of making vinyl acetate[1,2] and other vinyl esters have been described in reports by teams of technical investigators who were sent into Germany at the close of World War II. This paper presents some information concerning the preparation of monomeric vinyl esters of organic acids, the mechanism of polymerization of vinyl acetate and other vinyl esters of organic acids, the preparation of copolymers and their properties, and a historical survey of German vinyl ester production.

Monomeric Vinyl Esters

In 1912 F. Klatte[3] prepared the first vinyl esters by the catalytic reaction of acetylene with organic acids in the presence of mercuric sulfate:

$$CH{\equiv}CH + RCOOH \rightarrow RCOOCH{=}CH_2$$

Vinyl chloroacetate was the first ester produced on a commercial scale and polymerized to a resin used in making varnishes.

By passing acetylene into glacial acetic acid, vinyl acetate is formed only in small quantities as an intermediate product which changes at temperatures above 70° C. into ethylidene diacetate by adding a second acid molecule:

$$CH{\equiv}CH + CH_3COOH \rightarrow CH_3COOCH{=}CH_2 + CH_3COOH \rightarrow (CH_3COO)_2CHCH_3$$

Vinyl acetate was not produced until it was observed in 1920 that the yield of vinyl acetate may be considerably increased by immediately removing the vinyl acetate from the reaction liquor. This was carried out by passing excess acetylene through glacial acetic acid-catalyst mixture, condensing the vinyl acetate vapor from the exit gas, and recycling the acetylene gas[4]. The effectiveness of the mercury catalyst was improved by dissolving mercuric oxide in glacial acetic acid and precipitating with fuming sulfuric acid, since water formed was eliminated[5]. Other catalysts can also be employed for the reaction, such as zinc or cadmium acetate, as well as benzoate[6], mercuric ortho phosphate[7], boron fluoride[8], alone or mixed with hydrofluoric acid[9], and others[10]. Continuous operation can be accomplished if fresh catalyst is run into the reaction vessel and spent mixture is removed[11]. The original Wacker process employing mercury catalyst in the liquid phase is still in use in French and Italian plants.

A few years later a vapor-phase process was developed in Wacker's research laboratory[12], consisting of passing a mixture of acetylene and acetic-acid vapor through a converter packed with zinc acetate (or zinc-cadmium acetate) on activated carbon at temperatures between 170 and 220° C. In 1929 the first vapor-phase process plant was put into operation at Burghausen, and enlarged in the course of the following years to a capacity of 200 t./mo. of vinyl acetate. In 1937 I. G. Farbenindustrie A.G. constructed a small plant of 30 t./mo. capacity at Hoechst. This plant was expanded to a capacity of 1000 t./mo. with a few modifications.

In the vapor-phase process, it is also essential to remove immediately the vinyl acetate from the reaction mixture in order to obtain a high yield and low by-product formation. At Burghausen acetylene and acetic acid vapor are passed through the converter at such speed that only 30% of the acetic acid and 12% of the acetylene are converted into vinyl acetate. After condensing the vinyl acetate, the acetic acid

The Author

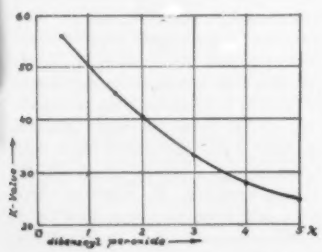
Norbert Platzer, a native of Norway, studied chemistry during 1930-1936 at the University of Vienna, Austria, where he received his Ph.D., and chemical engineering during 1936-1937 at the Imperial College, London. In 1937 he joined the Dr. A. Wacker Co., Germany, and worked for the first two years at the Research Laboratory (Consortium f. elektrochem. Ind.), the place of the discovery of polyvinyl alcohol and various other resins. Then he was transferred to the plant at Burghausen where he was concerned for 10 years with the production and application of vinyl plastics. He has been with Monsanto Chemical Co. since 1948.

*Reg. U. S. Pat. Office.
†Monsanto Chemical Co., Plastics Div.
Number references are on p. 170.

and acetylene are recycled. The over-all yield is 96 to 98% based on acetic acid and 92% based on acetylene. At Hoechst the speed is slower so that 60% of the acetic acid is converted in one passage, but the catalyst life which is 2000 to 3000 hr. at Burghausen is only 800 hr. at Hoechst.

To prevent the formation of hot spots during the strong exothermic reaction, the converters at Burghausen and Hoechst are constructed as multitubular reactors. The cooling medium at Burghausen is a mixture of high-boiling oil and isophorone (1:3), and at Hoechst high pressure water. The converters are made of mild steel, but all the other parts of the plant are of stainless steel, because acetic acid is present not only in the vapor but also in the liquid phase. Aluminum previously used was generally corroded after one year. The raw vinyl acetate is fractionated to a final product of 99.98% purity containing only 0.02% of acetaldehyde. Hydroquinone is normally used in the role of a stabilizer against the formation of acetyl peroxide.

The vinyl esters of other organic acids can be prepared analogously to vinyl acetate. Only vinyl formate cannot be made by the above described procedure; however, it can be obtained from vinyl acetate by reacting with formic acid in the presence of mercuric catalysts and precipitating it from the reaction mixture[15]. A great number of the vinyl esters of aliphatic and aromatic acids have been prepared. Their boiling points are shown in Table I.



1—Catalyst concentration's effect on polymerization degree (mass polymerization), shown by slope of "k"

A plant for manufacturing vinyl benzoate was in operation at Ludwigshafen on a semi-commercial basis, analogous to the vinyl-acetate vapor plants of Hoechst and Burghausen.[1] Zinc benzoate, as well as a mixture of cadmium benzoate and aluminum sulfate on pumice stone, was employed as the catalyst at 250 to 320° C.[14] Other analogous processes working batchwise in an autoclave or semi-continuously in liquid phase were only operated on a limited basis as a pilot plant undertaking.

Table I.—Boiling Points of Vinyl Esters

Vinyl ester	*Boiling range*	
	Temperature	*Pressure*
	°C.	*mm.Hg.*
Formate	46	760
Acetate	72	760
Propionate	34-35	70
Butyrate	115-117	760
Valerate	30-32	7
Caproate	35-36	7
Oenanthate	36-37	7
Laurate	105-112	2
Isoheptylate	156	760
Crotonate	23-24	7
Monochloroacetate	53-56	40
Dichloroacetate	53-56	25
Cyanoacetate	76-77	6
Chloropropionate	47-48	9
Phenyl acetate	75-78	2
Methoxyacetate	41-42	12
Butoxyacetate	68-72	11
Ethyl oxalate	68-70	9
Ethyl fumarate	112	11
Methyl formate	48-50	200
Methyl acetate	48-49	100
Benzoate	84	8

Polyvinyl Acetate

In 1913, F. Klatte[16] observed that vinyl esters are able to polymerize under the action of light and heat, and that the process may be catalyzed by active oxygen, especially dibenzoyl peroxide. Originally, vinyl chloroacetate was polymerized at Griesheim in two stages. By heating the monomer with benzoyl peroxide as catalyst, a viscous sirupy liquid was obtained and run into glass bottles where it was polymerized to a colorless, transparent, hard resin under the influence of light. The glass bottles were broken and the block formed was ground. This product was soluble in ketones, esters, and chlorinated hydrocarbons. Such solutions formed a lustrous film of good tenacity and showed excellent resistance against gasoline especially when filled with suitable pigments. Since 1935, polyvinyl chloroacetate has been produced at Hoechst in one stage and marketed under the trade-name "Mowilith G" in a finely ground grade and in solution.

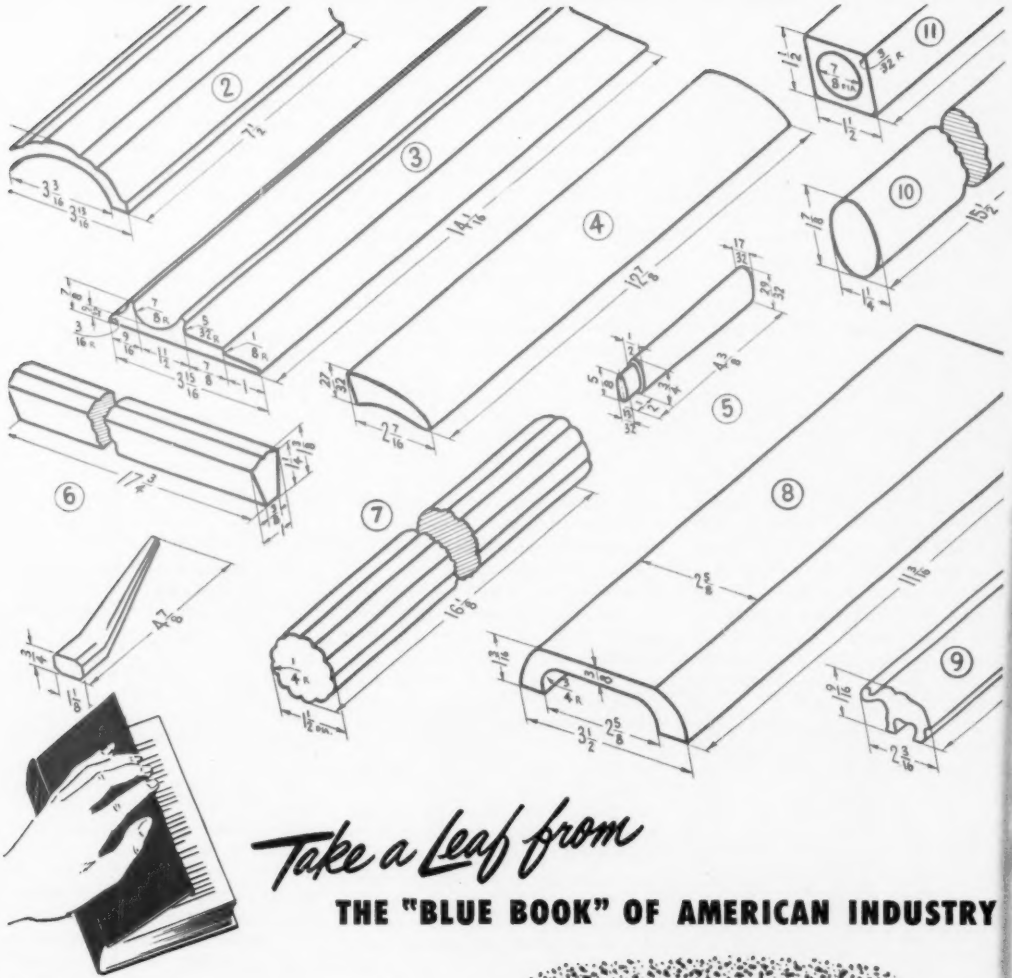
In contrast to polyvinyl chloroacetate, polyvinyl acetate has the advantage of being soluble not only in the above mentioned solvents, but also in methanol, ethanol, and aromatic hydrocarbons. Vinyl acetate is polymerized by four different methods: mass, solution, suspension, and emulsion. All these processes are carried out batchwise in stainless steel or enamelled kettles at Burghausen, while a continuous process[18] for the mass and solution polymerization is employed at Hoechst. The catalysts are generally 0.1% dibenzoyl peroxide in the first three processes and 0.8% hydrogen peroxide in the emulsion polymerization phase.

Mass Polymerization

Vinyl acetate can be polymerized to a solid mass, as described in previous reports[1]. The degree of polymerization can be varied by the amount and type of catalyst and inhibitor used. Increase of both results in a diminishing of the average molecular weight. With a greater number of catalyst molecules, a greater number of polymerization nuclei are formed; and with a greater number of inhibitor molecules, the chain reaction is broken up earlier. Normally the k-value, calculated from the viscosity according to the Fikentscher formula[17], is used as a measure of the degree of polymerization. Figure 1 shows the

Table II.—Solubility of Mass Polymers Made with 0.5% of Peroxide Catalyst

Peroxide	*Solubility*	*k-Value*
Dibenzoyl	Swells only	Not determinable
Dibutyryl	Complete	75
Dioleyl	Complete	80



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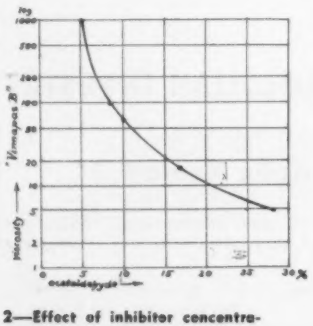
slope of the k-value with increasing concentration of catalyst.

When the amount of dibenzoyl peroxide is decreased in order to get a higher degree of polymerization, the final product is not completely soluble. In using peroxides of higher aliphatic acids, such as dibutyryl, dilauryl, or dioleyl peroxide as catalyst (see Table II), viscous, completely soluble products can be obtained in mass polymerization[18].

It has been proved[19] that the peroxides acting as initiators of polymerization reaction are built into the polymer chain.

The solid mass polymers of Hoechst are marketed under the trade-name "Mowilith", grades 20 to 90, where the numbers refer to the k-value of the grade. The degree of polymerization of the Burghausen product is determined according to the method of Hercules Powder Co. The time of fall of a 3-mm.-diameter steel ball is measured in a 50% alcoholic solution for the lower viscous "Vinnapas B" grades, and in a 20% ethyl acetate solution for the higher molecular weight "UW" grades.

To obtain the lower polymer grades a certain amount of inhibitor is added. To prepare grade B 5, for



2—Effect of inhibitor concentration on the degree of polymerization (with mass polymerization)

example, 30 kg. of acetaldehyde are fed to 1000 kg. of vinyl acetate. By adding less aldehyde the final degree of polymerization is correspondingly higher. The relation between inhibitor effect and degree of polymerization is graphically shown in Fig. 2 and 3. At Hoechst, propionaldehyde, which has a boiling point closer to that of vinyl acetate, is used as inhibitor.

Several patents refer to acceleration of polymerization by adding organic anhydrides[20].

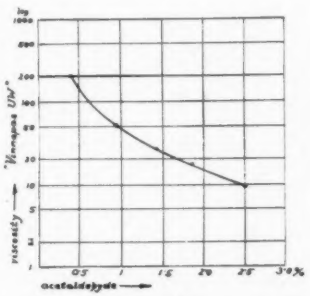
The pure polyvinyl acetate cannot be used for the manufacture of plastic articles owing to its low softening point. Various processes are described in which the polyvinyl acetate is treated at about 100° C. with acids or aluminum chloride, resulting in more or less infusible and insoluble products, but these were never applied to mass polymers.

Polyvinyl acetate has good light stability, excellent ability to form films, and outstanding adhesiveness. It is only compatible with a few other resins, but is miscible in all proportions with cellulose nitrate. In the presence of cellulose nitrate, compatibility with other resins increases, its hardness and water resistance improves, and its tackiness is reduced. Varnishes of polyvinyl acetate with cellulose nitrate are generally made of special low viscous grades, soluble in alcohol and benzene. These varnishes are used for white enamelling with oven drying up to 110° C. Combined with various pigments, low molecular-weight polyvinyl acetate is applied as spraying, brushing, and dipping lacquers for wood and metal[21].

Owing to its excellent adhesiveness, polyvinyl acetate can be used for bonding leather, artificial leather, wood, and textiles[22]; textile coating and finishing; veneering paper with metal foils; laminating felt upon metal; as interlayer in safety glass; as binding agent in grinding wheels; and in various other applications. In mixture with other resins, such as cellulose acetate, polyvinyl acetate can be applied as a molding compound in the manufacture of phonographic records[23]. For this purpose also, mixtures of polyvinyl acetate with waxes, such as carnauba wax, can be used and are characterized by a high hardness. The wax can be added before or during the polymerization[24].

Polymerization in Solution

Vinyl acetate can be polymerized batchwise or continuously in the presence of solvents[25]. Such polymers, made under conditions of temperature and catalyst analogous to those used to make mass polymers, show a lower degree of polymerization, even when using an indifferent solvent. The depression of the k-value depends upon the type and the quantity of the solvent used, as shown in Table III. By using solvents containing active groups, such as chlorine or carbonyl, the depres-



3—Effect of inhibitor concentration on the degree of polymerization (polymerization in suspension)

sion is much greater because these compounds are linked into the polymer chain, analogous to the peroxides, and inhibit further growth of the chain[26].

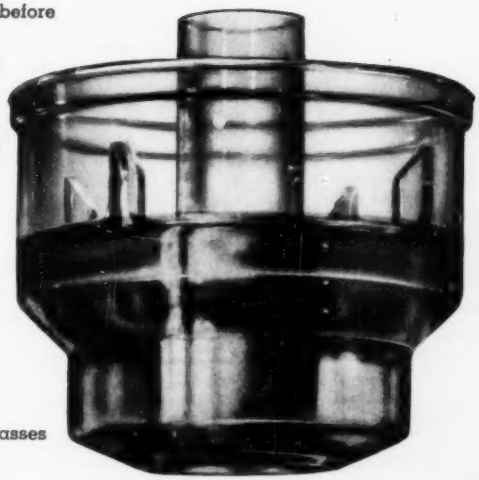
Generally 50 to 60% solutions of vinyl acetate in methanol, ethanol, ethyl acetate, acetone, butyl acetate, benzene, or toluene are polymerized in the presence of 0.1% dibenzoyl peroxide. These solutions are sometimes mixed with cellulose nitrate to increase adhesion and fastness to light of lacquers or of wood coatings. Films prepared from these polyvinyl acetate solutions retain considerable quantities of solvent and monomer, making the complete isolation of the solid polymer from the liquid practically impossible by evaporation only. Several methods have been described to obtain a product free of any solvent[27], but they were never able to compete in costs with the polymers derived from aqueous suspensions.

Polymerization in Suspension

The polymerization of vinyl acetate is a strong exothermic reaction, evolving 28 kcal. per mole. The heat of reaction is removed in mass and solution polymerization by boiling the monomer and solvent under reflux. This can also be done by the

dirt checker

The clear Tenite case of this oil-bath air cleaner for fractional-horsepower motors provides an instant check on the amount of oil and dirt in the unit, and warns when oil should be replenished to cleanse dirt from air before it enters the carburetor.



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Tenite outer case molded by PlaSticks, Inc., also of Chicago.

TENITE *an Eastman Plastic*

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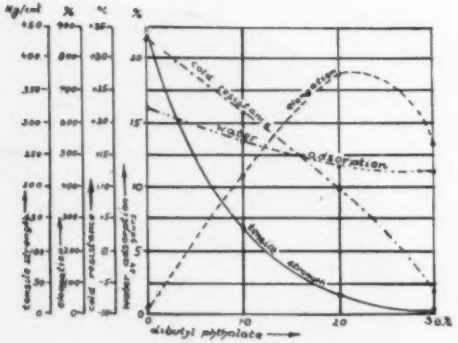

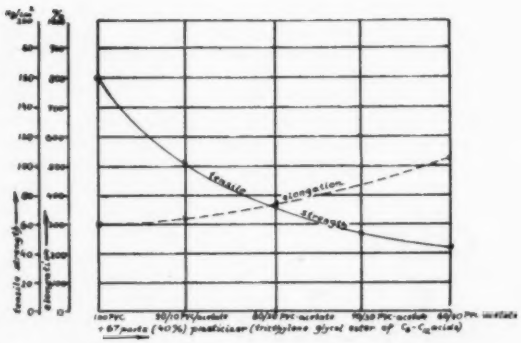

Left: 4—The effect of a plasticizer admixture on various characteristics of a dried vinyl acetate film of 0.5 mm. thickness. Right: 5—Mechanical properties of vinylchloride-acetate copolymers possessing equal plasticizer content

water in aqueous suspension or emulsion. This method of polymerization is preferred because of its lower cost and freedom from fire or explosion hazards. The polymerization in aqueous suspension or emulsion, originally developed for styrene, butadiene, vinyl chloride, and acrylic esters, can be carried out batchwise or continuously[23].

Vinyl acetate tends to hydrolyze in the presence of water into acetic acid and vinyl alcohol. The latter changes immediately into acetaldehyde which acts as an inhibitor. It was found that the lowest hydrolysis rate occurs when the pH range is 4 to 5.

In contrast to ordinary emulsifying agents such as surface active soaps or soaplike compounds, water soluble high polymers such as gelatin[29], pectin, fish glue, starch, methyl cellulose, polyacrylic salts, and polyvinyl alcohol and its water-soluble derivatives[30] can be used. At Burghausen, equal parts of vinyl acetate and water are suspended by agitation with 0.02% of polyvinyl alcohol. At Hoechst a special dispersing agent, the ammonium salt of the copolymer of maleic anhydride and styrene, is used.

The vinyl acetate suspended in fine droplets in water is polymerized in the presence of a catalyst soluble in vinyl acetate, such as 0.1% of dibenzoyl peroxide[31], which brings about the formation of small polymer spheres of 0.1 to 2 mm. diameter. The size of the so-called "pearl" grade is regulated by varying the speed of the agitator. The degree of polymerization is regulated by adding various amounts of acetaldehyde or propionaldehyde as inhibitors. This method may be considered as a modified mass polymerization and is generally preferred, having the advantage of simpler processing. The final products have a higher molecular weight than the mass polymers and are normally infusible. The "Vinnapas" grades UW (*U*nfusible, *W*atery suspension) 10 to 1000 of Wacker Co. and Mowilith grades K (*K*ugel meaning sphere) 50 to 90 of Hoechst are dried at 40° C. to 0.2% moisture content in special driers to prevent agglomeration of the spheres.

Table III.—Effect of Solvent on the Degree of Polymerization of Polyvinyl Acetate

(Catalyst: 1.0% dibenzoyl peroxide)

Solvent	*k-Value*
None	50
30% benzene	45
30% ethyl acetate	42
30% methanol	38

Processes have been described but never employed to carry out the polymerization in the presence of small amounts of insoluble substances, such as talcum or barium sulfate[32] or of larger quantities of electrolytes[33] an example of which is sodium chloride.

The lower viscous polymers are mainly used in the preparation of varnishes and lacquers or converted into polyvinyl alcohol emulsifier or polyvinyl acetal resins[34]. The higher molecular-weight polymers are converted into polyvinyl alcohol for belting application[35]. A few experiments were undertaken to fix the small glassy pearls on cinema screen, with the result that an excellent light reflection was produced.

Polymerization in Emulsion

In contrast to the suspension process, polymerization in emulsion takes place in the aqueous phase. A water-soluble catalyst such as 0.8% hydrogen peroxide[36] or potassium persulfate [36, 37], and a greater amount of emulsifier such as 5% of polyvinyl alcohol (incompletely saponified) or 3% of a hydrolysis product of aliphatic (C_{14}-C_{18}) sulphonyl chloride mixtures, are employed. The monomer, distributed by agitation in a very fine dispersion, is to a certain extent soluble in water and polymerizes therein. The polymer precipitates in the form of a fine emulsion, and more vinyl acetate dissolves until all the monomer is polymerized. The heat of reaction is removed by the water and by boiling the monomer under reflux. At Hoechst the pH is kept at 5 by adding formic acid.

By this method, 400 t./mo. of polyvinyl-acetate emulsion are produced at Hoechst, 600 to 1000 t./mo. at Ludwigshafen, and 400 t./mo. at Burghausen. The solid content is 50 to 70%, stable and unchangeable over a period of years. These emul-

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sions are compatible with other components, such as plasticizers and organic and inorganic pigments. Mixed with plasticizers they are cold resistant, i.e., they may freeze at low temperatures, but show the original degree of dispersion after thawing. The plasticizers used are normally dibutyl phthalate (¾ emulsion + ¼ DBP), tricresyl phosphate (¾ emulsion + ¼ TCP), or mixtures (⅔ emulsion + ⅙ TCP + 1/12 methyl glycol phthalate + ¼ water). The effect of plasticizer admixture on various properties of a dried polyvinyl acetate film is graphically illustrated in **Fig. 4.**

According to the emulsifier type employed, emulsions of different viscosity are obtainable. A 5% solution of polyvinyl alcohol of a k-value of 60 gives a 50% emulsion of 150 to 200 poises viscosity with a particle size of 0.5 to 2μ, whereas a size of 0.005 to 0.2μ is obtained with the sulfonated hydrocarbon emulsifier, or of 0.03μ with vinyl sulfonic salts[20].

By extracting polyvinyl-acetate emulsion prepared with polyvinyl alcohol as emulsifier with water, only 50% of the initial polyvinyl alcohol can be washed out. The remaining portion of polyvinyl alcohol is probably linked to the acetate polymer which explains several characteristics, such as high stability against coagulation at low temperature and against electrolytes.

Of the polyvinyl acetate emulsion production, 70% is used as cold glue for wood, in the manufacture of plywood, for textile finishing, as bonding agent for paper[21], and for synthetic leather. Polyvinyl acetate emulsion is preferred to other adhesives since heating and frequent mixing are not required. Shoe soles are made of waste leather fibers molded at 60 to 70° C. with the emulsion as binding agent.

The emulsion can be broken by adding precipitants, such as tanning agents or salts of trivalent metals (e.g., aluminum sulfate), and this is made use of in the preparation of fibrous leather.

Most grades are slightly acid which is undesirable in some uses. The acidity can be easily removed by cautious addition of ½ to 1% ammonia, sodium acetate, sodium phosphate, or other buffer salts.

Very fine dispersed emulsions are applied for surface coating and impregnation of paper; the small particles are able to penetrate deep into the base. Paper, pretreated to prevent disintegration in the wet state, is immersed in a bath containing emulsion, plasticizer, pigment, and water as required to give spreading consistency. The wet impregnated paper is passed through a drying box, automatically festooned into a chamber of 60 to 80° C. and, after two coatings, is embossed. The finished material is used as artificial leather cloth for book binding, lamp shades, and other fancy goods.

Shoe linings and double-texture shoe fabrics are produced by spreading on three to five coats of plasticized emulsions containing fillers and pigments, and drying on a steam-heated cylinder. In the manufacture of a replacement for table oilcloth, polyvinyl-acetate emulsion gives a superior performance to the linseed oil material used previously. It withstands hot dishes better, does not crack so readily in the cold, and eliminates the prolonged festooning period associated with linseed oil.

Extended investigations and weathering tests have been made at Hoechst and Burghausen and by several paint manufacturers on the use of polyvinyl-acetate emulsion mixed with fillers and pigments as interior and exterior paints on wood, metals, and plaster. Owing to the high binding power of polyvinyl acetate, concentrations up to six parts per one part of emulsion of fillers or pigments, such as iron oxide, zinc oxide, titanium dioxide, lithopone, talcum, ochre, whiting, and umber can be used. If resistance to scrubbing and washing is required, the filling should not be raised above a ratio of two parts of filler to one part of emulsion. These paints can be easily applied on all types of surfaces, such as wood, plaster, wallpaper, and tarred cardboard, either with an ordinary paint brush or a spray gun. On metal surfaces an anticorrosive paint should be applied first, followed by the emulsion as a second or third coat. In contrast to the hardening of the common varnishes and oil paints, the polyvinyl acetate film is less glossy, remains soft, and cannot be painted over easily with normal oil paints or primers.

Iron or aluminum vessels or wooden barrels coated with wax or paraffin are best suited for storing or shipping large quantities of polyvinyl-acetate emulsion. Small amounts of emulsion, e.g., for use as adhesive, can be kept in glass bottles with rubber or PVC stoppers (not cork).

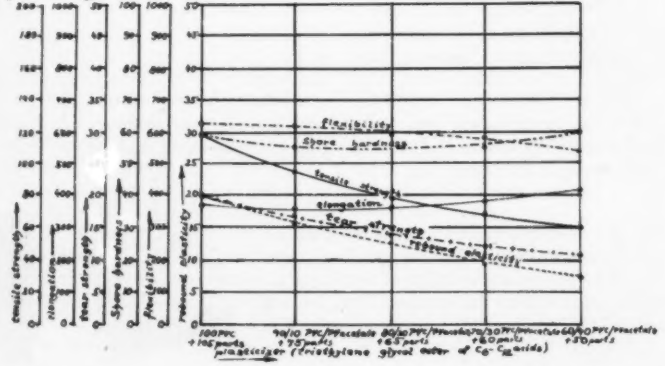
Experiments were conducted in Germany to preserve foodstuffs by coating with polyvinyl-acetate emulsion, and to use polyvinyl acetate for flexible first aid dressing.

Other Polyvinyl Esters

Polymerizability and softening point decrease with increasing length of the acid chain. For instance, vinyl formate gives a hard resin, whereas vinyl butyrate at the

(*Continued on p. 167*)

6—Mechanical characteristics which are inherent in vinylchloride-acetate copolymers having equal hardness, but possessing different plasticizer content



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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. Send requests for periodicals to the publishers listed.

Materials

SILICONE RUBBER EMERGES AS A DIELECTRICAL MATERIAL. J. F. Dexter. Electrical Manuf. *45*, 100-3, 200, 202, 204 (June 1950). Data are given to indicate that silicone rubber possesses most of the properties of an ideal dielectric. These include good insulating properties; exceptional stability to heat, cold, moisture, oxidation, and corona; good resistance to a variety of oils and chemicals; resilience, shock and abrasion resistance; and resistance to both mechanical and electrical fatigue. All of these properties, chemical, physical, and dielectric, are maintained under the most severe operating conditions. Present production equipment can be used in extruding silicone rubber over wire and cable or in molding silicone rubber parts to replace organic rubbers and plastics. A recent announcement which greatly extends the usefulness of silicone rubber is the development of Silastic Tape, Type R. This semi-vulcanized, fibrous-glass reinforced, pressure-sensitive tape may be used instead of conventional organic tapes as an insulation for coils and cables. In some applications it may be used as a mica substitute. A short oven cure bonds the layers of tape to form a homogeneous, waterproof, dielectric jacket.

THERMALASTIC INSULATION IMPROVES HIGH-VOLTAGE GENERATOR COILS. G. L. Moses. Westinghouse Eng. *10*, 163-5 (July 1950). A new electrical insulation material composed of flake mica and a copolymer polyester resin is described.

DEVELOPMENT OF THE NATIONAL BUREAU OF STANDARDS CASTING RESIN. P. J. Franklin, D. M. French, and W. C. Nyberg. National Bureau of Standards Circular 493, 10 pp. (May 22, 1950). The development, compounding, uses, and properties of a casting resin are described in detail. This resin which was developed for potting electronic equipment consists of 33% 2,5-dichlorostyrene, 21% styrene, 13% hydrogenated terphenyl, 0.5% of 40% divinylbenzene solution, 21.5% poly-2,5-dichlorostyrene, and 11% polystyrene. Various organic peroxides are used as catalysts. Mechanical, electrical, optical, and thermal properties are reported.

PREPARATION OF OIL-SOLUBLE PHENOLIC RESINS. Li-Hou Sun, Hua-Shan Liu, Chen-Chung Hsiung and Ke-Kung Yeh. J. Chem. Eng., China *15*, 17-27 (1948): Chem. Abstracts *44*, 1277 (Feb. 10, 1950). The preparation of oil-soluble phenolic resins is described.

POLYVINYL CHLORIDE PASTES. D. L. Clarkson and N. D. MacLeod. Chemistry & Industry *1949*, 751-5. The compositions, properties, and uses of polyvinyl chloride pastes are described.

NEW METHOD OF MANUFACTURING RUBBER HYDROCHLORIDE. R. Houwink. Rubber Developments *2*, No. 3, 2i-2 (1949). A new process for producing rubber hydrochloride in a powder form is described.

STYRENE PLASTICS. S. E. Glick. Product Eng. *21*, 81-6, 159 (Mar. 1950). The properties and applications of styrene plastics are reviewed. Recent developments are described.

Molding and Fabricating

MOLDING OF POLYTHENE. K. J. Persak. India Rubber World *121*, 315-16 (1949). The molding of polyethylene is discussed.

STANDARDIZATION OF ROUND MOLDS IN GERMANY. M. Freund. Brit. Plastics *22*, 178-83 (Apr. 1950). Standard parts for round molds being considered by the German Standard Institution are presented. One advantage is to achieve interchangeability of parts.

Applications

EVALUATION OF SEVERAL ADHESIVES AND PROCESSES FOR BONDING SANDWICH CONSTRUCTIONS OF ALUMINUM FACINGS ON PAPER HONEYCOMB CORE. H. W. Eickner, NACA Technical Note 2106, 23 pp. (May 1950). From a study of a number of adhesive processes for bonding paper honeycomb cores to aluminum-alloy facings, it was found that in general the range of adhesive spread producing satisfactory joints was comparatively broad for each adhesive studied. Best results were ordinarily obtained when the adhesive was applied to both facings and cores. The four bonding processes which were found to give the best quality joints in preliminary tension tests were used in a further investigation to determine the effect of the amount of adhesive spread on the tensile strength of bonded specimens. All four bonding processes were found capable of producing good joints between aluminum and paper honeycomb when moderately heavy spreads were applied to both cores and facings. The use of lighter spreads or the application of adhesive to only the core or the facing usually resulted in lower quality bonds, but with some of the adhesives the strength of the joints was sufficiently high for the lighter spreads to be considered satisfactory. The tensile strengths obtained when using optimum spread conditions in fabricating specimens for the tests to determine the effect of spread were generally lower than those obtained with specimens prepared for the preliminary tests under similar bonding conditions. The rate of heating of the joints, the panel size, the variability of the strength of the core material, and the differences in the construction of the test specimens might account for the difference in joint-strength results obtained in the two parts of this investigation.

THERMOPLASTICS FOR TEMPORARY MECHANICAL PROTECTION OF MATERIALS AND EQUIPMENT. E. E. Halls. Plastics (London) *15*, 48-9, 74-7, 102-5, 142-4 (Feb., Mar., Apr., and May 1950). Strippable coatings for

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"ELASTEX" [illegible] Stabilizer	30
Fatty Acid Ester	10
Stabilizer Blend	4
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the temporary protection of tools and equipment are reviewed. Requirements of these materials are outlined.

MOLDING FOR THE TRANSPORT INDUSTRIES. A. A. Tomkins. Brit. Plastics *22*, 216-25 (May 1950). Molding problems encountered in making plastic parts for motor cars are described and discussed.

TRANSPARENT PACKAGING FILMS. C. L. Capper. Inst. Rubber Ind. *25*, 225-31 (1949). Recent developments in transparent packaging films are reviewed.

PLASTICS IN FABRIC COATING. D. S. Plumb. S.P.E. J. *6*, 7-9 (May 1950). The properties, types, and production of plastic-coated fabrics are described fully.

LAMINATED PLASTICS INSULATION. P. E. Littlefield. Product Eng. *21*, 135-9 (Apr. 1950). The electrical and mechanical properties of laminated plastics of interest in electrical applications are reviewed.

Coatings

VINYL RESINS IN INDUSTRIAL COATINGS. R. W. Quarles. Official Digest, Federation Paint & Varnish Production Clubs No. 297, 699-710 (1949). The formulation of industrial coatings from vinyl resins is described here.

CHLORINATED RUBBER IN THE PAINT INDUSTRY. B. S. Gidvani. Paint Manuf. *19*, 419-24 (1949). The chemistry, properties, and applications of chlorinated rubbers particularly for use in coatings are reviewed.

Properties

USE OF ELECTRICAL MEASUREMENTS TO PREDICT THE MECHANICAL PROPERTIES OF PLASTICIZED POLYVINYL RESINS. A. J. Warner A.S.T.M. Bull. No. 165, 53-7 (Apr. 1950). Tests demonstrate the usefulness of the electrical approach to the general problem of the plasticization of polar polymers, and in particular the *k*-value concept introduced affords a relatively simple approach to the general subject of plasticizer-polymer relationships which is becoming of increasing importance to the technologist in this field. It should not be overlooked that the electrical approach to the study of plasticized systems is offered only as a guide to further, more intensive work and that other considerations in plasticizer technology, such as volatility, moisture sensitivity, etc., must be studied in the normal manner.

MOLECULAR WEIGHT INVESTIGATIONS OF HIGH POLYMERS WITH THE ELECTRON MICROSCOPE. B. M. Siegel, D. H. Johnson, and H. Mark. J. Polymer Sci. *5*, 111-20 (Feb. 1950). The electron microscope is used to estimate the molecular weights of four polystyrene fractions which had molecular weights of 4.8×10^5, 1.1×10^6, 1.8×10^6, and 2.5×10^6 as determined by osmotic pressure and viscosity. Dilute solutions (1 p.p.m.) of them in cyclohexane were deposited onto collodion substrates in minute droplets of approximately 2 microns radius. Shadow-casting with 3 A. of uranium gave the necessary contrast for observing the dispersion of the single spheroidal particles obtained by this method of deposition. Assuming that the particles were single molecules and that their density could be taken for a first approximation as the density of bulk polystyrene, the molecular weights obtained were 6.0×10^5, 9.9×10^5, 1.9×10^6, and 2.5×10^6, which agrees within the limits of error with the osmotic pressure and viscosity values.

DYNAMIC ELASTIC PROPERTIES OF SOME HIGH POLYMERS. K. W. Hillier and H. Kolsky. Proc. Phys. Soc. (London) *62B*, 111-21 (1949). Apparatus to measure the transmission of sound along filaments at frequencies between 1000 and 6000 cy./sec. is described. The dynamic elasticity and damping factors of polyethylene, neoprene, and nylon are reported and related to molecular rearrangements during stretching.

EFFECT ON ELASTOMERS OF FREONS AND OTHER HALOHYDROCARBONS. B. J. Eiseman, Jr. Refrig. Eng. *57*, 1171-4, 1179, 1195 (1949). The swelling and elasticity properties of several elastomeric gasket materials in contact with refrigerants are reported.

DURABILITY TESTS OF METALITE SANDWICH CONSTRUCTION. D. G. Reid. A.S.T.M. Bull. No. 164, 28-31 (Feb. 1950). The effects of a service period and cyclic accelerated exposure test on the strength of aircraft sandwich construction are reported. The laboratory test is limited in predicting service life but is invaluable in comparing various materials and fabrication processes.

Testing

DETERMINATION OF MONOMER IN PARTIALLY POLYMERIZED ACRYLIC AND ALLYL ESTERS. C. E. Albertson and I. R. MacGregor. Anal. Chem. *22*, 806-9 (June 1950). The partially polymerized mixture of acrylic and allyl esters is precipitated in a very finely divided state from a pyridine solution by dropwise addition to aqueous bromide-bromate reagent. The bromine released upon acidification adds quantitatively to the finely dispersed sample and the excess bromine is determined by conventional iodometric analysis. This analytical procedure was developed primarily to follow the course of bulk polymerization reactions.

ELECTRICAL METHOD FOR EVALUATION OF PROTECTIVE COATINGS AS MOISTURE BARRIERS. M. A. Arthur. A.S.T.M. Bull. No. 160, 57-8 (Sept. 1949); Discussion, ibid, No. 166, 51-3 (May 1950). The change in electrical resistance of a phenolic resin substrate is used as a detector in the evaluation of moisture barrier coatings. Results with asphalt, wax, and phenolic, alkyd, and vinyl resin coatings are reported. The asphaltic materials were superior to the others on 5 weeks immersion.

PRELIMINARY CONSIDERATIONS FOR TESTING SANDWICH RADOME MATERIALS. G. R. Huisman and R. H. Wight. A.S.T.M. Bull. No. 164, 19-20 (Feb. 1950). The effect of specimen size and construction of sandwich materials on the results of tests, particularly those to determine flexural and stiffness properties, are fully discussed.

ANALYSIS OF DATA ON PLASTICS LIFE TESTS. W. L. Gore. Analytical Chem. *22*, 684-6 (May 1950). Analytical methods of treating data are outlined, which are generally applicable where individual tests may be divided into two categories (good and bad) and where multiple tests may be run, so that the classifications can be expressed as fractions. Analysis of data on life of plastics is illustrated.

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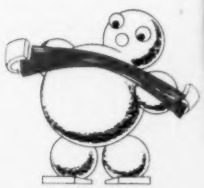

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U. S. PLASTICS PATENTS

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VINYLTHIOPENE. E. C. Pitzer (to Standard Oil). U. S. 2,505,204, Apr. 25. A copolymer of a vinylthiophene and a diolefinic compound.

COATING. W. F. Brucksch, Jr. (to U. S. Rubber). U. S. 2,505,347, Apr. 25. A polymerizable mixture of diallyl phthalate and a polyfumarate of ethylene glycol and diethylene glycol.

ELASTOMER-RESIN COMPOSITION. L. E. Daly (to U. S. Rubber). U. S. 2,505,349, Apr. 25. A homogeneous thermoplastic mixture of acrylonitrile-butadiene copolymers and a styrene-acrylonitrile copolymer.

POROUS RESIN. C. F. Fisk (to U. S. Rubber). U. S. 2,505,353, Apr. 25. A microporous resinous product prepared by mixing a polyester, a liquid ethylenically unsaturated compound, an alkali metal hydroxide, silica gel, and a catalyst, and heating.

MOLDING POWDER. G. E. Gliss (to Western Electric). U. S. 2,505,355, Apr. 25. Apparatus for plasticizing plastic material.

POLYMERS. D. L. Schoene (to U. S. Rubber). U. S. 2,505,366, Apr. 25. Polymeric reaction product of a monomeric glycol and a vinyl sulfone.

SILICON RESINS. J. B. Rust and H. van B. Joy (to Montclair Research and Ellis-Foster). U. S. 2,505,431, Apr. 25. Reacting silicon oxychloride with an organo magnesium halide to replace chlorine in the former compound with a hydrocarbon group.

MOLDING. F. K. Goldhard. U. S. 2,505,540, Apr. 25. Injection molding apparatus.

MOLDING. J. V. Bertrand (to Hydropress). U. S. 2,505,602, Apr. 25. Dielectric heating for injection molding machines.

WELDING. N. S. Norris. U. S. 2,505,647, Apr. 25. Process for welding thermoplastic bodies.

MOLDING COMPOSITION. J. G. Meiler and K. B. Bollerslev (to Plywood Research Foundation). U. S. 2,505,782, May 2. Molding composition comprising lignocellulose, sulfur, and phenol-aldehyde resin.

MOLDING. L. L. Stott. (to Polymer Corp.). U. S. 2,505,807, May 2. Method and apparatus for molding polyamides and like thermoplastics.

RESINS. E. P. Irany and H. D. Noether (to Celanese). U. S. 2,505,830, May 2. Acetone-insoluble polysulfone resins are recovered from sulfur dioxide solutions by adding diluent and precipitating with an alcohol.

RESINS. H. D. Noether and E. P. Irany (to Celanese). U. S. 2,505,833, May 2. Introducing oxygen into an unsaturated hydrocarbon and treating with liquid sulfur dioxide.

COPOLYMERS. P. O. Tawney (to U. S. Rubber). U. S. 2,505,844, May 2. Copolymerizing a castor oil-maleate ester with a monoolefinic compound in carbon tetrachloride with a peroxy catalyst.

POLYVINYL ACETAL. F. J. Curtis (to Monsanto). U. S. 2,506,014, May 2. Composition of polyvinyl acetal resin and a still residue of chlorinated phenyl compounds.

CELLULOSE FIBERS. P. S. Steinlin (to Aktiengesellschaft Cilander). U. S. 2,506,040,1-2-3-4-5-6, May 2. Processes for obtaining regenerated effects on regenerated cellulose fibers.

DESIGNS. C. B. Mountcastle (to E. D. McCurdy). U. S. 2,506,165, May 2. Applying a stencil to expose a plastic surface, contacting with solvent and metal particles, drying, and buffing.

LACQUER. G. Klinkenstein. U. S. 2,506,223, May 2. Coating comprising a cellulose plastic, an alkyd or urea-aldehyde resin, and solvent-non-solvent mixture.

RESINS. J. H. Vail (to Anaconda Wire). U. S. 2,506,320, May 2. A mixture of siloxane resin, a polyvinyl acetal resin, and cresylic acid.

RESIN. H. L. Bender, A. G. Farnham, and J. W. Guyer (to Union Carbide) U. S. 2,506,486, May 2. Thermosetting resin from a diphenol and a diglycidyl ether of a diphenol.

GEL. C. E. Barnes and W. O. Ney, Jr. (to General Aniline). U. S. 2,506,537, May 2. A thermal-reversible aqua-gel containing polyvinyl alcohol and an interpolymer of acrylic acid or α-substituted acrylic acid with an amide thereof.

POLYSILANE. E. R. Lieberman (to Interchemical). U. S. 2,506,676, May 9. α, ω-bis(2-chloroethoxy) polymethylpolysiloxanes.

ELECTRONIC PREHEATER. G. B. Sayre (to Boonton Molding). U. S. 2,506,814, May 9. Electronic device for preheating pills of molding material.

MASS POLYMERIZATION. W. W. Crouch (to Phillips Petroleum). U. S. 2,506,857, May 9. Polymerizing a diolefin in the presence of a finely divided alkali mixed with an inert diluent.

COATED FABRIC. W. W. Koch (to Hercules). U. S. 2,507,107, May 9. Textile fabric bearing a coating comprising a wetting ethyl cellulose coating, and an ethyl cellulose coating of different ethoxy content as a toughening coating and plasticizers in both coatings.

CONDENSATES. E. Lieber (to Standard Oil Development). U. S. 2,507,111, May 9. A high molecular weight condensate of sulfur dichloride with stearoyl phenol.

POLYMERIZATION. D. W. Young and H. D. Hineline (to Standard Oil Development). U. S. 2,507,133, May 9. Mixing vinyl isobutyl ether and a nitrite ester diluent and polymerizing with a Friedel-Crafts catalyst.

STABILIZERS. C. J. Chaban (to Stabelan Chemical). U. S. 2,507,142-3, May 9. Stabilizing a polymerizate of an unsaturated halogen compound by subjecting it to contact with an inorganic peroxide and a metal salt of an acid stronger than metaboric.

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POLYMERS. J. B. Dickey and H. W. Coover, Jr. (to Eastman). U. S. 2,507,147, May 9. A polymer of an α-and a β-acyloxyvinyl alkyl sulfone.

POLYVINYL AMINE. D. D. Reynolds and W. O. Kenyon (to Eastman). U. S. 2,507,181, May 9. Reacting a polyvinyl cyclic imide with hydrazine hydrate, precipitating in ethanol, acetylating, precipitating, and separating polyvinyl acylamide.

CONDENSATES. L. K. Eber (to G. E.). U. S. 2,507,199, May 9. Heating a phenol in the presence of a methylol melamine whereby the reaction rate with furfural is increased.

COPOLYMERS. E. A. Kern (to G. E.). U. S. 2,507,209, May 9. Forming a mixture of α-vinyltetrahydronaphthalene and styrene and heating until a colorless polymer forms.

PROLAMINES. W. L. Morgan and C. R. Faelten (to American-Maize Products). U. S. 2,507,263, May 9. A prolamine-base protein plasticized with an ether monocarboxylic acid.

SILOXANES. R. R. McGregor and E. L. Warrick (to Dow Corning). U. S. 2,507,316, May 9. Linear chloromethyl methyl siloxanes.

POLYMERIZATION. R. G. Heiligmann (to Atlantic Refining). U. S. 2,507,388, May 9. Polymerization of α-alkylstyrenes in a liquefied normal monoolefin in the presence of a Friedel-Crafts Catalyst.

SILICONES. C. A. MacKenzie (to Montclair Research and Ellis-Foster). U. S. 2,507,413-4, May 9. An organo-silicon elastomer and resin and processes for making same.

POLYMERS. J. B. Rust and C. A. MacKenzie (to Montclair Research and Ellis-Foster). U. S. 2,507,422, May 9. Subjecting an ester of a silicic acid to dry oxygen at high temperature until a polymer is formed which retains the ester groups.

FILLERS. J. W. Ayers (to Agrashell). U. S. 2,507,465, May 9. Continuously feeding coarse organic matter into a dry-operating, fine-grinding mill, adding a base, and water insufficient to change the dry nature of the material, simultaneously grinding and drying, and withdrawing when sufficiently fine to pass 100 mesh.

ORGANOSILOXANES. J. T. Goodwin, Jr. (to Dow Corning). U. S. 2,507,519-20-21, May 16. Siloxane copolymers and polymers.

TELOMERS. W. E. Hanford and R. M. Joyce, Jr. (to Du Pont). U. S. 2,507,568, May 16. Subjecting a mixture of a polymerizable aliphatic hydrocarbon and a halogenated lower aliphatic acid to heat and pressure and a peroxy catalyst and isolating products having in the molecules a plurality of molecules of the olefin and components of one molecule of the chlorinated compound.

INTERPOLYMERS. R. M. Joyce, Jr. (to Du Pont). U. S. 2,507,718, May 16. Interpolymers of an azobisformic acid ester of a saturated alcohol with an ethylenically unsaturated aliphatic compound.

OLEFIN POLYMERS. F. J. Moore and M. M. Stewart (to Texas Co.). U. S. 2,507,864, May 1. Passing olefins in contact in a reaction zone with an aluminum silicate gel containing nickel oxide and polymerizing under heat and pressure.

INTERPOLYMERS. P. O. Tawney (to U. S. Rubber). U. S. 2,507,871, May 16. Copolymerizing in the presence of a peroxide catalyst, an allyl alcohol and an alkyl diester of an α-unsaturated dicarboxylic acid.

ANION EXCHANGE RESINS. J. H. Payne and H. P. Kortschak (to Pacific Chemical and Fertilizer). U. S. 2,507,992, May 16. Regenerating an anion exchange resin of the amine-aldehyde type by passing an aqueous slurry of calcium hydroxide upwardly through a porous bed of the resin.

CELLULOSE ESTERS. W. J. Burke (to Du Pont). U. S. 2,508,013, May 16. Process for preparing acetone-soluble cellulose acetate propionate.

POLYVINYL BUTYRAL. M. T. Harvey (to Harvel Research). U. S. 2,508,025, May 16. Composition of polyvinyl butyral in intimate relationship with a resinous condensate of furfuryl alcohol and formaldehyde.

SILOXANE POLYMERS. M. P. Seidel, J. Swiss, and C. E. Arntzen (to Westinghouse). U. S. 2,508,196, May 16. Hydrolyzing and partially condensing an organosilane having hydrolyzable groups.

COPOLYMERS. A. M. Clifford and J. R. Long (to Wingfoot). U. S. 2,508,226, May 16. A copolymer of 2-cyano-3-methylbutadiene-1,3 and butadiene-1,3.

VINYL RESINS. W. K. Wilson (to Shawinigan). U. S. 2,508,341-2-3, May 16. Polymerizing vinyl compounds in the presence of surface active agent, a hydrophilic colloid, and an oxygen-liberating material.

PLASTIC PELLETS. L. W. A. Meyer (to Eastman). U. S. 2,508,414, May 23. Continuous process for forming strips of colloidized organic thermoplastic compositions.

SYNTHETIC FIBERS. W. R. Marshall (to Union Carbide). U. S. 2,508,462, May 23. Apparatus for forming fibers under non-oxidizing conditions from a fusible organic polymer.

EXTRUSION. G. Consalvo (to R. Wampach). U. S. 2,508,495, May 23. Extruding device for plastic materials.

POLYMERS. G. D. Jones (to General Aniline). U. S. 2,508,717-8, May 23. Catalytically polymerizing a monomer-halide complex obtained by treating a monomeric N-disubstituted amide of an acrylic acid with a Friedel-Crafts catalyst and washing the product with ammonia solution.

POLYMERIZATION. J. E. Troyan (to Phillips Petroleum). U. S. 2,508,734, May 23. Emulsion polymerization of an unsaturated compound with a diazo thioether-ferricyanide-mercaptan-dihydroxy aromatic compound.

BRISTLES. J. J. Reis, Jr. (to Pittsburgh Plate Glass). U. S. 2,508,799, May 23. Synthetic brush bristles.

POLYMERIZATION. M. L. Sans (to Societe Anonyme des Manufactures des Glaces et Produits Chimiques de Saint-Gobain Chauny et Cirey). U. S. 2,508,801, May 23. Heating vinyl chloride in the presence of peroxy catalyst and a metallic salt capable of reacting with hydrochloric acid.

MELAMINE RESINS. M. J. Scott (to Monsanto). U. S. 2,508,875-6, May 23. Coating resin comprising the heat-reaction product of a methylol

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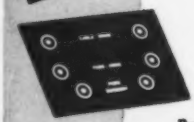

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melamine-alcohol condensate with an aryl sulfonamide.

MOLDING COMPOSITION. E. M. Sadowski and W. P. Miller (to R. C. A.). U. S. 2,508,893, May 23. Molding composition for phonograph records comprising polyvinyl acetal, polyvinyl acetate, a plasticizer, Vinsol resin, mold lubricant, wax, and filler.

WATERPROOFED TEXTILES. M. J. Scott and S. H. Rider (to Monsanto). U. S. 2,509,174, May 23. Waterproofing textile fabrics by impregnating with an aminotriazine condensate etherified with a saturated unsubstituted alcohol and an unsaturated alcohol and heating.

RESINS. R. W. Auten (to Rohm and Haas). U. S. 2,509,183, May 23. A toluene-soluble thermosetting condensate of an alkanol, a dihydrazide, and formaldehyde.

POLYMERS. J. H. Bartlett (to Standard Oil Development). U. S. 2,509,203, May 30. Esterifying a fumaric acid with an alcohol having 12 to 14 carbon atoms and thereafter polymerizing with a peroxide catalyst.

INTERPOLYMERS. W. T. C. Hammond (to Sherwin-Williams). U. S. 2,509,495, May 30. Heating a reaction mixture of an aromatic vinyl hydrocarbon, a drying oil, and sulfur.

MOLD. L. Ruhland. U. S. 2,509,531, May 30. Method and mold for making elastic bags.

BONDING DEVICE. H. Hacklander (to Singer Mfg.). U. S. 2,509,595, May 30. Machine for bonding plies of thermoplastic material together using a high frequency current.

SPECTROGRAPHIC TREATMENT. D. P. Norman (to New England Spectrochemical Laboratories). U. S. 2,509,699, May 30. In analysis of high-polymeric materials, the method of dissociating non-gaseous specimens into the molecular and polyatomic fragments and introducing these into the positive column of a glow discharge so as to radiate therein and spectroscopically comparing said radiation with that from another specimen similarly obtained.

PLASTIC RIBBON. G. Slayter (to Owens-Corning Fiberglas). U. S. 2,509,845, May 30. Apparatus for producing a thin sheet of thermoplastic material.

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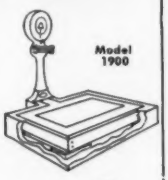

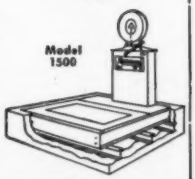

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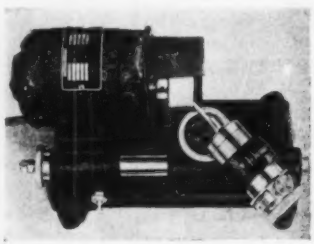
NARROW-BAND HEATERS—A new-type, long-life, narrow-band electric heating unit has been developed by Watlow Electric Mfg. Co., 1320 N. 23rd St., St. Louis 6, Mo., to meet the demand for the steadily increasing temperatures required in plastics molding. Higher heat concentration—at least 40 watts per sq. in.—and elimination of costly production breakdowns are operating merits claimed for the new units. By using a group of these heaters, only a fractional heat and wattage loss results if a unit burns out. Thus, a plastics molding machine equipped with the narrow-band devices could be kept in operation while one of the units is being replaced—even though the molding cycle might be slowed. Life span is also increased through use of a special clamping band that assures proper contact between the heating unit and the cylinder to be heated.

SPEEDY FASTENER—Rapid fastening of plastics parts in assembly departments is expedited by a new unit, the Screwstick, developed by American Screw Co., Willimantic, Conn., for continuous driving of small screws. In operation, a one-piece stick of identical screws (each joined to its neighbor) is inserted into the special chuck of the device's power driver. As power is applied, the whole stick feeds forward automatically, each driven screw being twisted off at the neck by pre-controlled torque. Hand drivers are also available. The Screwstick is produced in diameters Nos. 0, 1, 2, 3, and 4, in mild steel, brass, aluminum, or nickel silver.

CUTTER GRINDER—Engraving cutters may be sharpened on the job with the new precision cutter grinder introduced by New Hermes, Inc., 13-19 University Pl., New York 3, N. Y. Inexperienced plant personnel can easily operate the simple, accurate, inexpensive device. Claimed as the outstanding feature of the apparatus is the index unit on the spindle which allows the operator to grind



any desired cutting profile with proper angles and clearance. Two-, three-, and four-fluted cutters can also be ground and sharpened by using the attached index plate. The cutter feed dial is marked in 0.001-in. graduations, and is powered by a ⅙-hp. motor with a speed of 6000 r.p.m. The grinder is provided with an adjustable clamp head for radius grinding.

OIL TRANSFER SYSTEM—Closely controlled processing temperatures up to 600° F. are provided without the necessity for high-pressure equipment by the new electric oil transfer system announced by Hynes Div., Martin-Quaid Co., 1879 W. Sedgley Ave., Philadelphia 32, Pa. Through use of the firm's multi-pass electric heater, the new system is capable of removing moisture and eliminating the carbonization problem present in heating operations involving jacketed vessels, heat exchangers, platens, and rolls. The heater provides high-velocity flow of the transfer liquid over large heating surfaces having low-watt density, yet is compactly arranged to require minimum space. The transfer liquid, usually oil, flows back and forth over the staggered heating surfaces in a flat, turbulent stream which prevents any dead spots in the system.

MIXER—Precision blending of any dry, free-flowing material is claimed for the MacLellan mixer manufactured by The Anglo American Mill Sales Co., 1000 Kennaday Ave. Owensboro, Ky. Specific mixes, such as extremely small percentages, are said to be easily fulfilled on the MacLellan. In operation, materials are charged into the mixer's lower compartment and are divided by wings. Rotation of drum carries materials above the axis until they fall by gravity, discharging successively from pairs of pockets, pyramiding into the other end of the drum. This operation is repeated every half revolution, giving 60 complete separations and mixes with every five revolutions.

DRILL CHUCK—Self-tightening and self-centering with a high degree of accuracy and rigidity are major advantages attributed to the new Ettco-Emrick Keyless Ball-Bearing Drill Chuck developed by Ettco Tool Co., Inc., 594 Johnson Ave., Brooklyn 6, N. Y. Tools required in any specific operation are merely inserted in the chuck and hand tightened; machining action centers the tool and tightens the grip.

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(*Continued on p. 135*)

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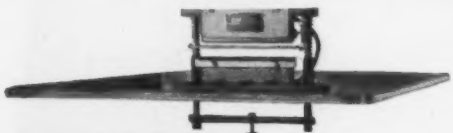

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KNEADER-MIXER—Lower charging level and an unlimited choice of unloading positions are the principal merits of the new Superkneader Series of North-Erie double-arm-type mixing and kneading machines manufactured by The H. W. North Co., 1213 Parade St., Box 1171, Erie, Pa. The improved design, available in models up to 3000 gal., is claimed to offer new advantages in floor space requirements. Tiltable models have capacities said to be nearly double the rating of lighter-duty machines. Heavy-duty models include intensive-type internal mixers for masticating and dispersing plastics, rubber stocks, resin paints, floor coverings, and compositions of a similar nature.

HYDRAULIC PRESS—Two models of a new hydraulic press have been added to the line of air-operated Han-D-Presses previously made and distributed by Hannifin Corp., 1154 S. Kilbourn Ave., Chicago 24, Ill. A tamper-proof provision is a major feature of the equipment. Should an operator tie down either control, the ram will advance on the first stroke thereafter, but will not return, making it impossible to complete the cycle. This same non-return arrangement, when one of the two operating levers is held down, makes it possible to "inch" the ram

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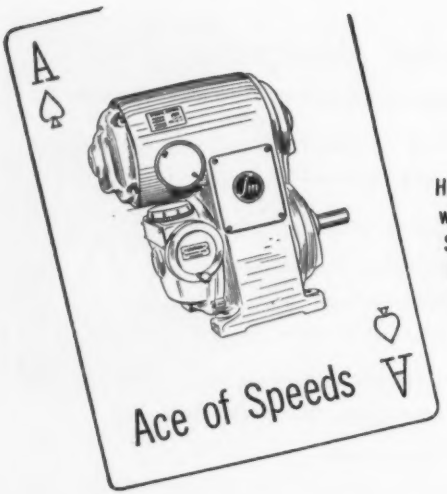

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HYDRAULIC INDEX TABLE—To meet the demand for a larger edition of its index table, The Denison Engineering Co., 1160 Dublin Rd., Columbus 16, Ohio, has produced a hydraulically-powered 33-in. unit which has a 24-in. work-circle. The new accessory, which can be used on the firm's 35-ton Multipress or on similar machines, provides variable speeds for any preselected in-

dexing rate from 10 to 70 indexes per min., and positions the dial with an accuracy of ±0.002 inch. When installed on the Multipress, it is run by the pumping unit of the press.

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(*Continued on page 139*)

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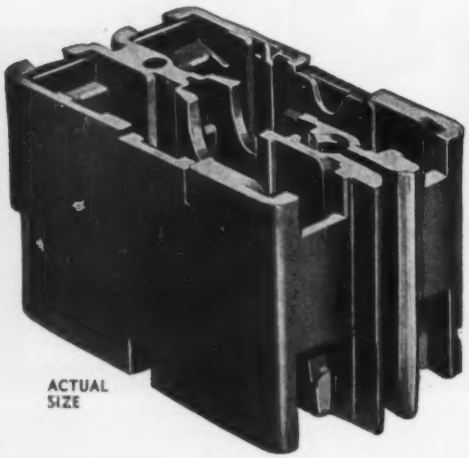

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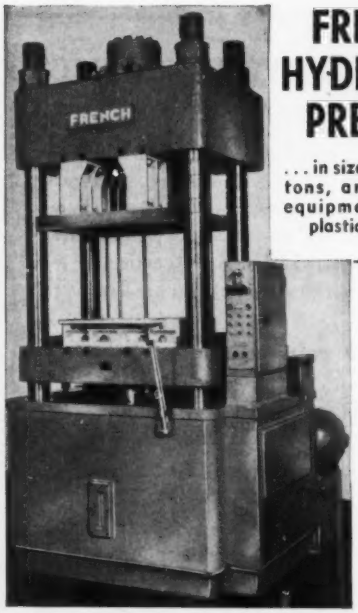

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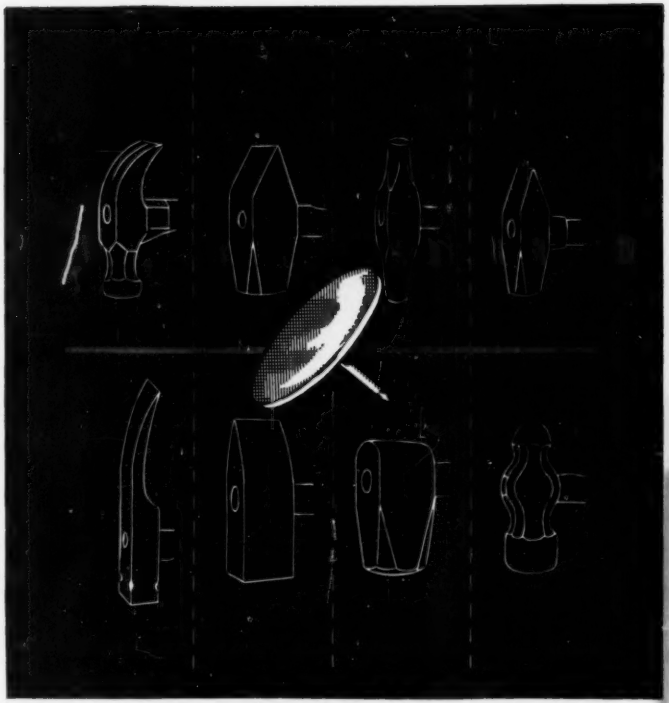
tomatic ejection of parts; and a built-in "skip-station" accessory which permits hurdling from one to five stations without loss of time at idle stations, and which is said to be useful for short production runs.

IMPROVED PYROMETER—Modifications in its Capacitrol line of indicating pyrometer controllers have been announced by Wheelco Instruments Co., 847-851 W. Harrison St., Chicago 7, Ill. A new control system, the Capaciline, has been incorporated in the electronic control circuit of a standard pyrometer to compensate for over- and undershooting tendencies characteristic of process control applications using ordinary on-off-control.

Straight hairline control is achieved by using an anticipatory voltage without affecting the true temperature reading at the control point. This new control thus provides uniformity in the heating chamber of fuel and electrically powered equipment by continuously varying fuel input to meet process needs. The Capaciline-Capicitrol combination is said to be particularly adaptable to heat-treating and processing plastics and chemicals where close control is an essential consideration.

HEAT TRANSFER MELTER—Melting, preheating, or heating such materials as elastomeric hot melts, hot-melt coatings and sealing compounds, and thermoplastics is the primary purpose of the Magnaflow Melter, produced by The Magnaflow Co., 8564 Washington Blvd., Culver City, Calif. Said to be equally suitable for either intermittent or continuous production-line operation, the new unit is available in two models: the 83-G, which produces melted material in a continuous flow of 60 to 90 lb. per hr.; and the 83-F, which turns out up to 360 lb. per hour.

The melter is essentially a heat transfer machine with a heating cycle of less than 20 seconds. Other features claimed for the equipment include: automatic feed; a self-cleaning mechanism that ejects foreign objects; a heat-control unit that permits selection of temperatures from 50 to 600° F.; and delivery of required temperature within 5 to 10 min. from the switch-on time.



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We often recommend combinations of these stabilizers in ratios and concentrations to yield maximum utility. For example, two or more stabilizer types, such as Barium and Cadmium may produce optimum results. Remember though, regardless of what vinyl system you are processing, Ferro's flexible, complete line of stabilizers used singly or in combination will furnish results that will make you happy. Like more information?

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BOOKS AND BOOKLETS

Write for these publications to the companies listed. Unless otherwise specified, they will be sent gratis to executives who request them on business stationery.

"Kent's Mechanical Engineers' Handbook." Two Volumes: "Design and Production," edited by Colin Carmichael; "Power," edited by J. Kenneth Salisbury.

Published by John Wiley & Sons, Inc. 440 Fourth Ave., New York 16, N. Y. Price, $8.50 per volume.

This twelfth edition of Kent's famous handbook has been almost completely rewritten. A change in editorial emphasis is indicated by the new subtitle "Design and Production" for one volume, to underscore the fact that design and production are becoming recognized as simply two phases of a single activity—the engineering of a product from the inception of an idea to the completion of the finished article at an economical cost.

In the "Power" volume, the objective has been to cover the entire field of heat-power engineering and transportation, as well as the important aspects of fluid flow. Considerable space has been subtracted from less active subjects and has been devoted to more modern and less widely understood topics such as atomic power; combustion gas turbines; supersonics; marine engineering; jet propulsion; aircraft piston engines; heat pumps; panel heating; Diesel and electric locomotives; and axial-flow compression.

"Organic Coatings in Theory and Practice," by A. V. Blom.

Published by Elsevier Publishing Co., Inc., 215 Fourth Ave., New York 3, N. Y. 300 pages. Price $4.75.

During the past two decades, the organic coating industry, including paints, varnishes, lacquers, enamels, impregnations, and adhesives, has undergone sweeping changes in raw materials, methods of manufacture, and finished products. This book is an analysis of the situation resulting from these developments, with an attempt to indicate future trends of research and technology.

The material covered includes the fundamental considerations of organic coatings; film-forming materials from natural sources; synthetic film-forming materials; physical and chemical film formation; pigment characteristics; and coating film properties and their testing. The text is supplemented by 82 tables and 121 illustrations.

"Phenolic Resins, Their Chemistry and Technology," by P. Robitschek and A. Lewin.

Published by Iliffe & Sons, Ltd., Dorset House, Stamford St., London, S.E. 1. Distributed by The British Book Centre, Inc., 122 East 55th St., New York 22, N. Y. 261 pages. Price $6.75.

Designed as an explanatory digest, rather than a catalog or encyclopedia, this book is an attempt to integrate the theoretical knowledge of phenolic resins with their industrial practice. Included and discussed are the more fundamental modern trends and developments; particularly physics and kinetics on the theoretical side and pulp-resin preforms on the technological side. There is also a discussion on the nature and meaning of tests and test results, providing a background for the interpretation of tabulated material. The book includes 121 diagrams, 16 photographs, 49 tables, and a complete index.

MR-resins—Detailed descriptions of the company's line of low-pressure MR-resins and how they are used in laminating, casting, coating, and impregnating are contained in this six-page technical pamphlet. Information includes solvent suggestions, compatibility with other resins, and a tabular presentation of the resin laminates reinforced with a specific Fiberglas cloth. *Marco Chemicals, Inc., Sewaren, N. J.*

So you want to use tubing—In commemoration of its 50th anniversary year, this company has issued a 60-page catalog presenting the products and services offered by it and its various subsidiary divisions—Wallace Tube Co. Div., Alloy Tube Co. Div., and Welded Truck & Specialty Co. Division. Specification tables and pictures supplement the text which describes equipment and methods for bending and fabricating pipe and tubing. *Wallace Supplies Mfg. Co., 1300 Diversey Parkway, Chicago 14, Ill.*

Shipping case packing and sealing—Providing information on the selection and use of corrugated and solid fiber shipping cases, this eight-page technical service bulletin notes the advantages, applications, composition, forms, properties, and sealing techniques of the firm's case-sealing adhesives for hand- or machine-sealing operations. A special section illustrates and describes well-known automatic case-sealing machines. A digest of fiberboard container facts is given, along with a discussion of interior packing techniques, use of cushioning materials, and a table of factors influencing the selection of case-sealing adhesives. A glossary of container terms is also presented. *Paisley Products, Inc., 630 West 51st St., New York 19, N. Y.*

Self-tapping screws—Complete descriptions of various types of the company's self-tapping screws and many examples of their use to eliminate unnecessary operations, speed assembly, and lower costs are contained in this 48-page bulletin which gives detailed application information such as hole and stock sizes, head styles, dimensions, and other valuable engineering data.

The bulletin covers the whole field of self-tapping screw application and offers recommendations for their use in light- and heavy-gage sheet metals, non-ferrous castings, metal forgings, plastics, resin-impregnated plywood, and asbestos compositions. *Parker-Kalon Corp., 200 Varick St., New York 14, N. Y.*

Lacquering styrene—Lacquering of molded styrene pieces is described in this bulletin. Prepared in response to the great increase in molded styrene items requiring satisfactory lacquers, the brochure, one of the first to make this information available, discusses lacquer requirements, methods and advantages, and production techniques—information designed to assist molders in considering styrene for production of ar-

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ticles generally manufactured of more expensive materials. *Monsanto Chemical Co., Plastics Div., Springfield, Mass.*

Colorimetry—Scientists and technicians concerned with color measurement will find much information in this new 56-page booklet which describes the standards and measurement methods developed by the National Bureau of Standards. The publication seeks to establish practical working standards of color and to set up and administer color tolerances. As a result, conformity to a color requirement can now be determined with the same assurance as mechanical properties, and this booklet gives the basis for each technique and shows how one method can supplement the other.

Chapters cover the following topics: the standard observer; illuminants and coordinate system; small-difference colorimetry; material standards of color; one-dimensional color scales; and general methods. Circular C478 is available at 30¢ a copy from *Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.*

Blueprint for industry—The fourth and fifth parts of this series of brochures are now available to the public. New developments in continuous extrusion take-up equipment is the subject of Part IV, a 12-page booklet which gives detailed, analytical descriptions of the most modern methods now being used in continuous extrusion take-up operations, and includes engineering drawings and specification tables. The brochure contains information on such developments as a new constant-tension continuous take-up machine with integral capstan and drive, and covers the latest extrusion systems for wire, cable, monofilaments and tubings.

Part V, containing 24 pages, illustrates and describes the many units and systems which this company has developed for handling and processing textiles, papers, films, and foils. It sets forth the firm's diversified line of web-handling equipment, comprising units of different kinds for different functions, including various types of let-offs, coaters, dipping machines, drive rolls, oven units, tensioning devices, and system drives. Among the complete web-processing systems described are impregnators for tire cord, cotton and rayon webs, and paper; paste-coating fusing ovens; rubber cementers and adhesive coaters; organosol coating systems; pilot plants for web coatings; aniline ink and cut-stock dryers; and foil and film coaters. *Industrial Ovens, Inc., 13821 Triskett Rd., Cleveland 11, Ohio.*

Industrial catalog—Covering applications for electronic, textile, automotive, aviation, and chemical industries, this new 16-page catalog describes the company's laminated thermosetting plastic materials for industrial uses. A special feature is the 1950 comparator chart, indicating significant properties for each of more than 50 standard grades. Another section is devoted to Pregwood, the company's impregnated and densified wood product. *The Formica Co., 4613 Spring Grove Ave., Cincinnati 32, Ohio.*

Polyvinyl chloride products—Technical data on all of the firm's Geon latices—water dispersions of polyvinyl chloride-base resins—is furnished in this four-page bulletin. Listings are given of the individual properties of the six latices now being marketed; characteristics of 4-mil cast film and 1-mil latex-coated paper made with them are presented. Methods used by formulators are discussed, and fields of application for the materials are cited. *B. F. Goodrich Chemical Co., 324 Rose Building, Cleveland 15, Ohio.*

Rust problems—Industrial rust prevention is covered in this catalog which gives easily understood directions which apply—under general exposure as well as special conditions which produce rust—to machinery and implement finishes, heat-resistant and chemical-resistant coatings, and floor coatings. The company's sealers for materials other than iron and steel are also featured.

The catalog presents 70 color chips, with specification descriptions which indicate resistant qualities, drying time, thinner requirements, and methods of application. *Rust-Oleum Corp., Evanston, Ill.*

Photoelectric amplifiers—The company's complete line of the latest in photoelectric equipment is described in detail in this eight-page catalog, which examines 33 devices and accessories for industrial applications, production control, counting, boiler and ventilating smoke detectors, and burglar and warning devices. The booklet also covers the company's engineering service for equipment requiring special design. *De-Tec-Tronic Laboratories, Inc., Dept. C, 1227 N. Clark St., Chicago 10, Ill.*

Interchangeable punches (Catalog No. 103)—The company's expanded line of Hercules interchangeable punches is illustrated in this 42-page booklet. Larger sizes that have been added to the standard square retainers and the full range of standard Hercules high-speed, round, interchangeable punches for thick, hard, and abrasive materials are covered. In addition, a new line of improved die buttons, including press-fit and interchangeable-type models, is illustrated. *Whitman & Barnes Div., United Drill & Tool Corp., Plymouth, Mich.*

Hysol 6000 (Bull. 601)—A new thermosetting material used for handling corrosive chemicals and for electrical insulation is described in this four-page technical bulletin. Inert to the corrosive action of practically all chemicals, including concentrated hydrochloric acid at room temperature, Hysol 6000 has an exceptionally high dielectric strength with high arc resistance. Available in rod, tube, and sheet form in a variety of sizes, it can be punched or machined to close tolerances by conventional metal working machinery, and can be cast into special shapes and components, offering unusual adhesion to metals, glass, ceramics, and other materials. Specifications on its chemical resistance and electrical properties, suggestions on how this material may be used, and details on its machining characteristics are given. *Houghton Laboratories, Inc., Olean, N. Y.*

Electric industrial heating units—Manufacturers of equipment requiring heating units, and processors of food, chemicals, plastics, rubber, oils, and paints will be interested in this 16-page catalog. Made up in loose-leaf, specification sheet form, the book lists voltages, watt-

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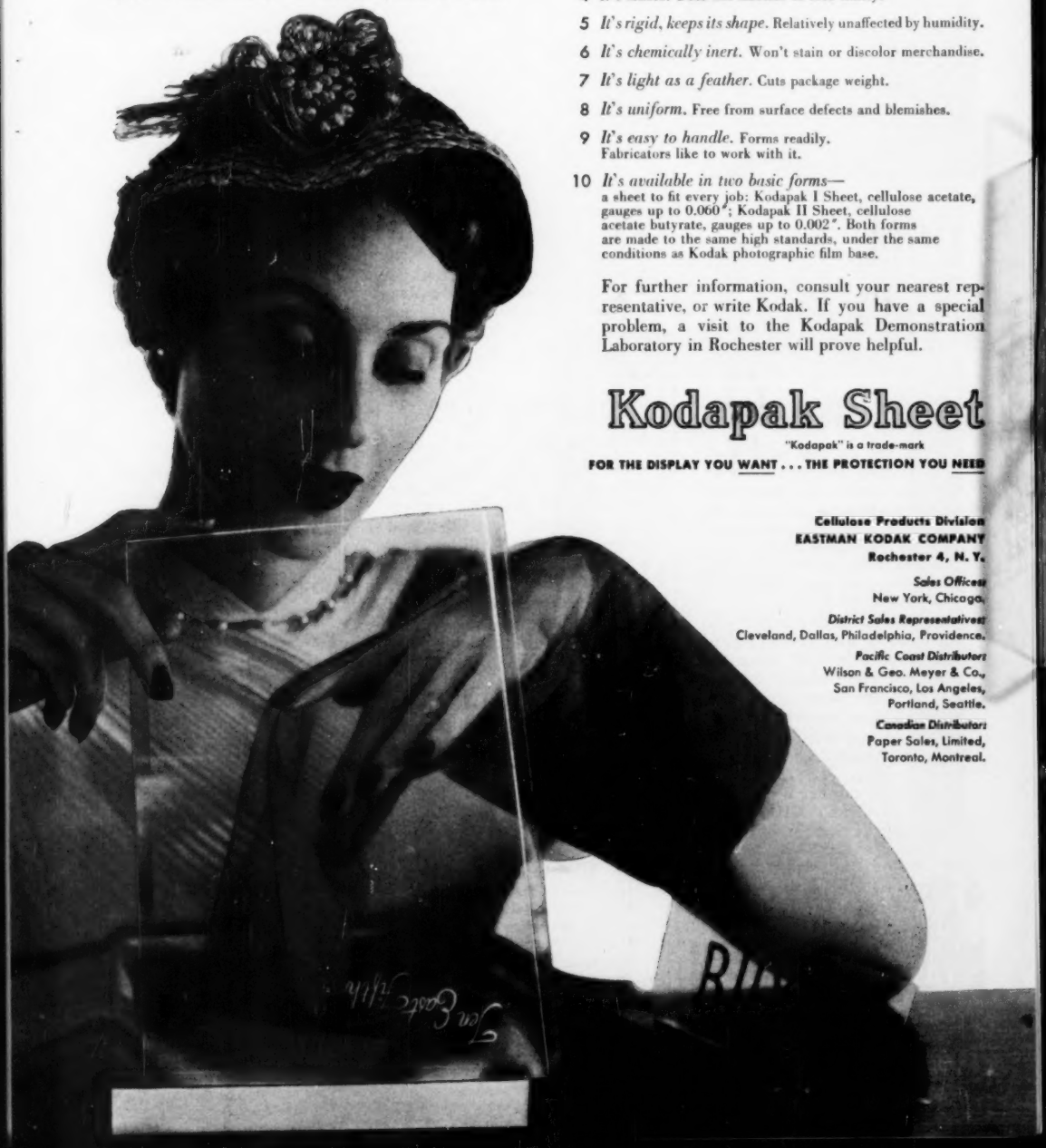

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ages, temperature ranges, dimensions, shipping weights and prices, as well as applications and uses for the Immersion, Urn-Type, Finrod, Rod-Type, and other electric heating units offered by the manufacturer. Data on connections and switches are also included. *Tuttle and Kift, Inc., division of Ferro Enamel Corp., 1827 N. Monitor Ave., Chicago 39, Ill.*

Air pumps—Catalog 450—The manner in which air pumps operate and where they are used effectively are fully described and illustrated in this 16-page booklet which contains performance curves and specification tables on the company's four-wing and two-wing type air pumps and accessories. A section of the new catalog deals with air motors which are air pumps operating in reverse with compressed air as the power source. They transmit power to any device to be operated, providing speed control and safety where flammable vapors, gases and dust are present. The pumps are of the rotary positive type. *Leiman Bros., Inc., 29-F Christie St., Newark 5, N. J.*

Recording thermometers, Bull. T-840—Information on the "Series 500" line of thermometers is presented in this 44-page book. Liquid filled, vapor-pressure, and gas-filled types are described for recording, indicating, controlling, and telemetering of temperatures; data are given on operating principles, characteristics of operation, temperature-sensitive bulbs, recording charts, and accessories. Resistance-type thermometers, humidity instruments, and time-temperature controllers are also treated. In addition, the booklet includes reproductions of actual temperature chart records and sketches of applications. *The Bristol Co., Waterbury 20, Conn.*

Correction

We have been informed by Susquehanna Plastics, Inc., that the vinyl mat, illustrated and described on page 77, August MODERN PLASTICS, is now being made of vinyl film especially slit for the purpose, and not from left-over ends.

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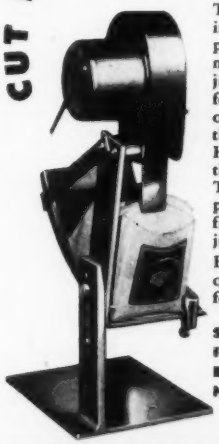

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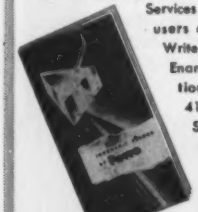

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INTERNATIONAL PLASTICS NEWS*

Activities Around the World of Interest and Importance to the Plastics Industry in the United States

Polystyrene production—Commercial production of polystyrene has started at the newly built plant of Monsanto Chemicals Ltd., Newport, Mon., England. Production is now based on imported styrene, but the company will later draw on adequate supplies of monomeric styrene from a new refinery to be erected by Fort Chemicals Ltd., at Grangemouth, Scotland. This plant, says E. A. O'Neal, Jr., chairman of Monsanto, will be ready in about two years. Another major polystyrene production program in the U. K. is being undertaken by Erinoid Ltd., already producing polystyrene molding powder from material made at the refinery of Petro-Carbon Ltd., Manchester, a company closely linked with the Shell group.

Benzene for U. S.—With plastics raw materials in short supply, British manufacturers are not too pleased with the recent agreement to export 22 million gal. of benzene a year to the United States for styrene production. Benzene is a vital raw material for the production of synthetic phenol so urgently needed for nylon and phenolic resins.

Vinyl waste pipes—Rigid polyvinyl chloride is finding some interesting applications in chemical research laboratories for waste pipes because of its high degree of chemical inertness, toughness, and nonflammability.

Sebacic acid plant—The Greigy Hardesty plant for the production of sebacic acid will soon come into operation at the Greigy works at Trafford Park, Manchester, Eng. The new development has resulted from the collaboration between Greigy Co., Manchester, and Hardesty Chemical Co., New York. Apart from several useful by-products which have not yet been fully explored, the new plant will also produce higher fatty alcohols for making plasticizers and other raw materials. It will be the only such plant operating outside the United States, and will be able to supply Europe and the British Empire as well as the home market.

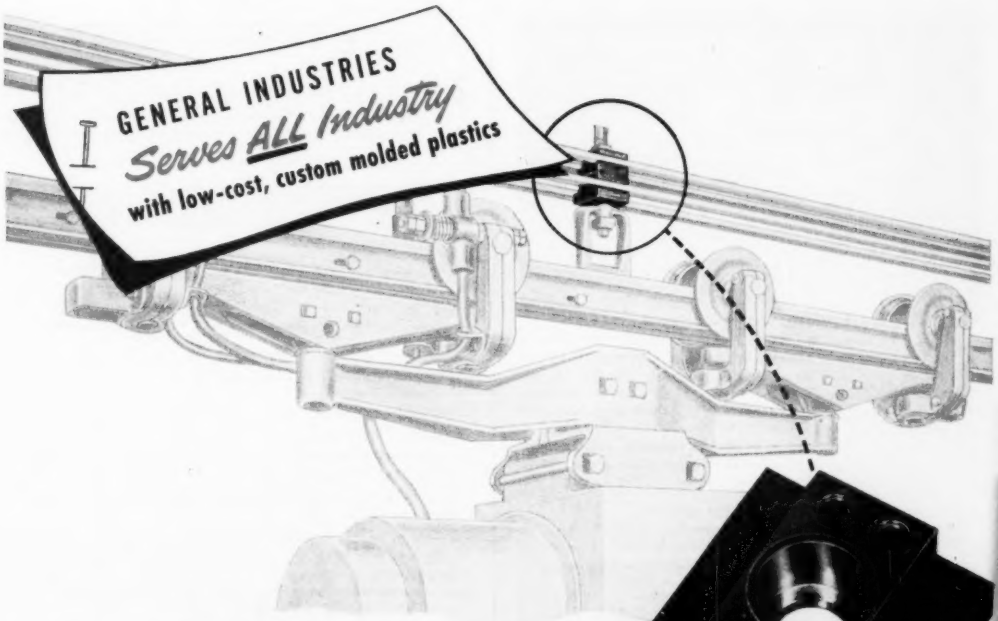
Acetate spectacle frames—Increasing quantities of cellulose acetate are now being used for spectacle frames prescribed by opticians under the British National Health Service. The demand for spectacles shows no signs of decreasing, and manufacturers expect to work to capacity for several years to come.

Plastics pearls—Plastics play an important part in the manufacture of British artificial pearl necklaces. Both acrylic and cellulose acetate molding materials are being used as the base. In spite of the greater cost of the acrylic molding powder, manufacturers are of the opinion that the beads have a superior finish and color and require less surface coating than acetate beads.

Wood waste board—Wood substitutes made of wood waste and urea formaldehyde are being used in increasing quantities by the building industry in England in place of ordinary plywood. Wood waste boards based on wood waste and phenolic-type resins are no longer being manufactured in the United Kingdom. The demand for densified woods is increasing and one of the most successful applications is for making bearings and brushes for paper mills.

Plastics for export—A new drive is being initiated by the British Board of Trade to increase exports of plastics. The Dollar Exports Board has already met representatives of the Moulders' Fabricators Groups and also Plastics Material Manufacturers Group to discuss plans for the future.

*Reg. U. S. Pat. Office.



14 Years—1,000,000 Insulator Blocks for The American MonoRail Company

No, this isn't a particularly intricate molding job—not for General Industries. But a top-notch plastics molder doesn't build his reputation solely on molding skill . . . he must be dependable, too—able to deliver *any* type plastic parts *when* and *as* they're needed by his customers.

That's why we're proud of our relationship with this leading overhead crane manufacturer. In the entire 14 years, delivery of these insulator blocks never has failed to be on schedule.

Next time you're in need of top-quality custom molded plastic parts—large or small—intricate or simple—we'll be glad to give you a personal demonstration of this dependability. Better yet, drop us a line and we'll come out and talk over your requirements.

SEND TODAY for your free copy of General Industries' new 16-page booklet, "Your Product in Plastics."

The GENERAL INDUSTRIES Co.

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In order to move them promptly, extremely attractive prices are available on Acadia Synthetic Products compression molded polystyrene sheets in all thicknesses from ⅛" to 1". These sheets have properties superior to those fabricated by other methods—no shrinkage at normal temperatures—better heat resistance. New low prices are also available on Saran*, Tenite, Vinylite and other thermoplastic sheets. Wire or write for quotations. (*Dow Chemical Co.)

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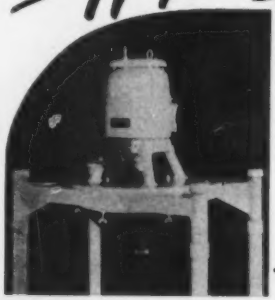
NEW *High Speed* **MIXER**



- Reduces Pre-Mixing Time
- Provides Complete, Uniform Dispersion of Plastics Ingredients
- Improves Color Blending

The "ENTOLETER" Mixer provides the simplest, most economical method of producing a homogeneous mix. It is easy to install and operate. Requires only 12 cubic feet of space; yet can produce a finished mix at rates up to 200 lbs. a minute. It is adaptable to either batch or continuous mixing. Entoleter Division, The Safety Car Heating & Lighting Co., Inc., 1195 Dixwell Ave., New Haven 4, Conn.

Send for bulletin and reprint describing results on plastics applications.

ENTOLETER
CENTRIFUGAL MACHINES

Production of

FOR the purpose of this report, production is the sum of the quantities of materials produced for consumption in the producing plant, for transfer to other plants

Materials	*Total prod'n. first 5 mos. 1950*	*Total sales first 5 mos. 1950*
CELLULOSE PLASTIC:[a]		
Cellulose acetate and mixed ester plastics:		
Sheets, continuous:		
Under 0.003 gage	4,613,888	4,445,305
0.003 gage and over	3,382,558	3,449,391
All other sheets, rods, and tubes	1,764,654	1,436,459
Molding and extrusion materials	30,010,680	28,676,227
Nitrocellulose		
Sheets	2,473,982	2,382,673
Rods and tubes	705,606	416,306
Other cellulose plastics[b]	5,014,048	5,155,698
PHENOLIC AND OTHER TAR ACID RESINS:		
Laminating	26,964,126	17,747,116
Adhesives	11,931,982	10,846,552
Molding materials[a]	86,741,545	71,738,005
Protective coatings (containing less than 10% modifier)	8,423,243	6,523,454
Miscellaneous uses (covers casting)	24,470,648	23,881,895
UREA AND MELAMINE RESINS:		
Adhesives	27,785,897	26,623,315
Textile- and paper-treating resins	11,087,827	8,890,643
Protective coatings, modified and unmodified	10,867,810	9,471,598
Miscellaneous uses, including laminating and molding[c]	25,268,419	23,273,533
STYRENE AND STYRENE DERIVATIVE POLYMER AND COPOLYMER RESINS:		
Molding materials[a]	97,094,592	103,464,150
Miscellaneous uses[d]	80,507,067	17,999,416
VINYL RESINS:		
Sheeting and film, including safety-glass sheeting[a]	92,313,145	79,751,947
Adhesive (resin content)	7,204,112	6,436,272
Textile- and paper-treating resins, including spreader and calendering types (resin content)[e]	18,413,009	17,003,237
Molding material (resin content)	46,609,309	43,427,371
Miscellaneous uses (resin content)[e]	9,542,586	5,344,017
MISCELLANEOUS SYNTHETIC PLASTICS AND RESIN MATERIALS:		
Molding materials[a, f]	22,279,761	22,175,120
Protective coatings[g]	26,125,452	25,647,951
All other uses[h]	81,554,283	79,303,630

[a] Includes fillers, plasticizers, and extenders. [b] Includes sheets, rods, and tubes, and molding and extrusion materials. [c] Data on resins for laminating and miscellaneous uses are on a dry basis; data on molding materials are on the basis of total weight. [d] Excludes data on protective coating resins; these data are included with miscellaneous coating resins to avoid disclosure of

Plastics Materials

of the same company, and for sale. Sales include only the quantities involved in bona fide sales in which title passes to the purchaser.

April 1950		May 1950	
Production	*Sales*	*Production*	*Sales*
1,073,553	1,032,594	911,090	902,121
691,742	720,842	711,408	757,306
379,107	358,381	297,694	273,243
6,301,186	6,226,163	6,518,165	6,113,153
501,518	454,452	565,499	508,690
85,929	67,716	84,754	79,303
926,172	925,598	897,619	1,012,275
6,334,527	4,168,157	6,213,377	4,216,029
2,149,140	1,891,680	2,486,907	2,238,607
17,086,432	14,917,266	17,246,646	14,572,214
1,866,951[1]	1,596,529	1,878,527	1,243,994
4,407,814	4,723,043	5,528,723	5,372,253
4,862,588	4,397,833	6,614,162	7,384,414
1,852,865	1,473,541	1,868,913	1,477,979
1,981,881	1,555,174	2,623,030	2,304,093
4,718,431	3,988,503	6,092,602	5,904,572
20,280,481	20,344,048	20,937,159	23,760,985
4,274,991	3,932,567	4,504,310	3,668,299
18,674,625	14,798,979	18,722,853	16,944,027
1,586,880	1,319,816	1,707,902	1,507,142
4,076,487	3,400,730	3,771,704	3,679,959
9,539,828[1]	8,376,151	10,123,771	9,486,678
2,067,764	1,065,126	1,666,178	841,693
3,924,671	4,698,585	5,181,700	5,144,731
4,752,443[1]	4,432,767	4,894,770	4,912,682
15,717,036	15,269,218	17,145,551	16,428,138

operations of individual companies. [e] Includes data for spreader and calendering type resins. [f] Includes data for acrylic, polyethylene, nylon, and others. [g] Includes data for coumarone-indene, petroleum, silicone, and other protective coating resins. [h] Includes data for acrylic, alkyd, coumarone-indene, nylon, petroleum, silicone, and others for miscellaneous uses. [r] Revised.

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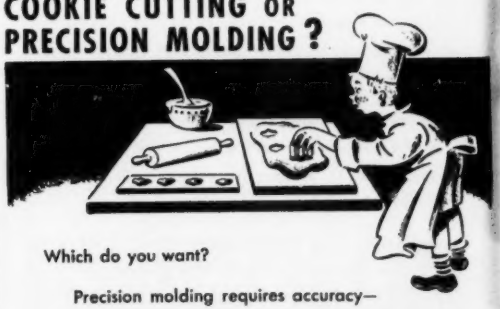
Silver tip hot junction for rapid response with Drill Angle Taper for proper seating — High Temperature Alloy Tension Spring holds thermocouple in place for good thermal contact.

Connector Panel for making and breaking thermocouple circuits rapidly. Available with 1 to 5 connections.

Send for our Catalog P describing these and our other temperature measuring equipment.

ThermoElectric FAIR LAWN NEW JERSEY

COOKIE CUTTING OR PRECISION MOLDING?



Which do you want?

Precision molding requires accuracy— experience — engineering — high technical skill — complete "know how" to design your piece, work out your problems, produce your piece to your complete satisfaction.

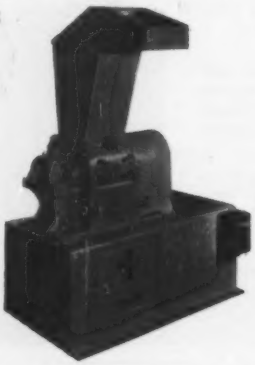
On the other hand, cookie cutting — well!

PLASTIC MOLDING CORPORATION
Custom Molders · Precision Molders
Sandy Hook Connecticut

Cold Mold • Hot Compression • Plunger Transfer • Injection

B&J model no. 251 with 8" x 8" throat

- 100-150 lbs. per hr. capacity
- large hopper
- 24" deep, 36" wide, 50" high for minimum floor space
- low priced



It's the most modernized rotary cutter for grinding departments, or mounting beside injection molding machines . . .

. . . for grinding large, thin sections without precutting as well as irregular gates and sprues, records, doll heads, reject parts and scrap.

Do your production requirements call for a table model midget cutter with a 5½" x 6" throat opening, 50 to 75 lbs. per hr. capacity? Check into the new B & J table model midget cutter.

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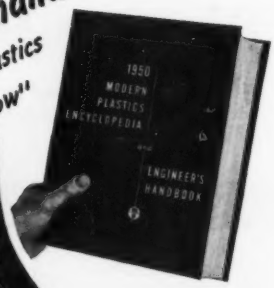

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Tells which type of machinery and equipment is best for a particular job.

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Explains how to select a molding method, how to buy a mold, which plastic to use.

Shows you the best techniques, the most economical ways to do any operation connected with plastics.

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uires. One simple weigh-
and the correct propor-
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color does not affect the
sical or chemical prop-
s of the plastic with
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rfere with normal
usion rates; does *not*
duce "blisters" and
ishes on the surface of
ded products; does not
le, streak or bleed; un-
dry powders, does not
round and contaminate
r machines; cannot
screens.

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r. Results will show at
hand how much can be
with Unicolor and
resin in place of pre-
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at Plax Corp. Div., Hartford-Empire Co., Hartford, Conn., had confirmed the film's permeability, Plaxpak polyethylene was chosen to do the job. The moth asphyxiant is available in 3 and 8-oz. packets wrapped in cellophane to prevent vapor loss in stock rooms or on retail counters. The 3-oz. container is effective for from three to four months in a confined area of 15 cu. ft., while the larger size will kill moths successfully in a space of 40 cu. ft. over a period of from four to six months.

The polyethylene packets have a grommet in one corner to permit hanging the bag on closet hooks. Use of the bag is said to minimize the loss of crystals through breakage, avoiding the need for sweeping up particles. If the crystals harden and pack, the tough, tear-resistant bag can be kneaded to loosen them.

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with 8

- 100-150 lbs. per
- large hopper
- 24" deep, 36" w
  for minimum fl
- low priced

. . . for grindin
cutting as well
ords, doll head

Do your produ
model midget cutter with a 5½" x 6" throat opening, 50 to 75 lbs. per hr. capacity? Check into the new B & J table model midget cutter.

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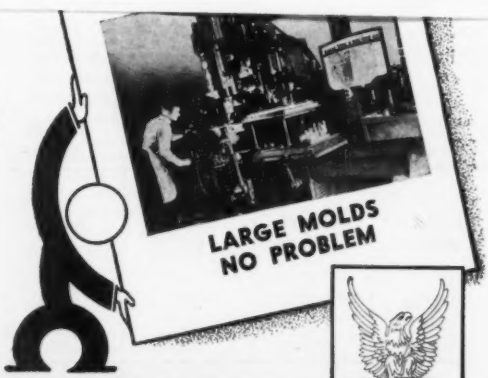

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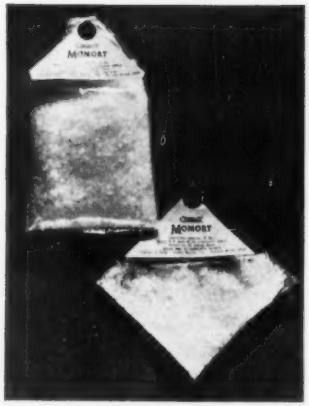

Moth-killing vapors escape through polyethylene film packet

Moth Killer Pack

BECAUSE polyethylene—which has a low degree of permeability for many chemicals—will permit para-dichloro-benzene vapors to pass through at a uniform rate, the life span of clothes-damaging moths has been appreciably reduced. Capitalizing on this characteristic of the plastic film, Crystal X Corp., Lenni Mills, Pa., developed a package to contain this moth-killing chemical, and is marketing the product under the name MoMort.

After tests by research personnel at Plax Corp. Div., Hartford-Empire Co., Hartford, Conn., had confirmed the film's permeability, Plaxpak polyethylene was chosen to do the job. The moth asphyxiant is available in 3 and 8-oz. packets wrapped in cellophane to prevent vapor loss in stock rooms or on retail counters. The 3-oz. container is effective for from three to four months in a confined area of 15 cu. ft., while the larger size will kill moths successfully in a space of 40 cu. ft. over a period of from four to six months.

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What is Unicolor?

A revolutionary resin color concentrate (1 part to 24 to color uncolored resin) that forms a molecular bond with the thermoplastic involved.

In What Specific Ways Does Unicolor Cut Costs?

Users costs are cut 3c, 4c, and 5½c per pound by purchasing plain, uncolored resins and doing their own coloring as needed. Inventory costs are cut, inventory losses prevented, production not delayed awaiting factory-colored resins; *short* mixing time increases extruder capacity.

In What Color Is Unicolor Available?

All standard colors. Special colors can be quickly matched, compounded and delivered. There is no need to wait for resin suppliers to run the color you need; the color wanted is instantly available when needed.

Are Special Skills, Special Machinery Required With Unicolor?

Any operator can mix Unicolor without special equipment. Coloring and extrusion are simultaneous. No more material need be prepared than the job at hand requires. One simple weighing and the correct proportion of pigment to uncolored resin is accomplished.

How Is Unicolor Different?

Unicolor does not affect the physical or chemical properties of the plastic with which it is used; does not interfere with normal extrusion rates; does *not* produce "blisters" and blemishes on the surface of extruded products; does not mottle, streak or bleed; unlike dry powders, does not fly around and contaminate other machines; cannot clog screens.

How Can Unicolor Be Tested?

Unicolor test samples are available for your own extruder. Results will show at first hand how much can be saved with Unicolor and plain resin in place of precolored plastics. Send requests for free samples, details, and prices to Unicolor Division. Westchester Plastics, Inc., Mamaroneck, New York.

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This beautifully illustrated book is used by many of America's leading corporations to solve gift problems. YOU will find in it luxurious, impressive fruit gifts for important customers and prospects; gifts for employees; and "budget" gifts for more general giving. Each is excitingly colorful—dramatic, delicious, appreciated—and REMEMBERED. Mission Paks are taken home for enjoyment by the entire family. It's easy to give a Mission Pak—no shopping, no wrapping, no mailing. Simply order from the natural-color catalog and the gift is delivered by Mission Pak. Safe delivery and satisfaction guaranteed.

Typical of hundreds of letters from business givers:

"We wish to advise that our customers indicate the Mission Pak boxes we had ordered sent to them for Christmas were "Out of this World." They all have had the highest praise for them. Thought you would appreciate having this favorable report."

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(Please attach to your business letterhead)

Send me full-color catalog of Gifts that are Remembered—by Mission Pak of California. No charge

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Stamp Gage and Magnifier

OF vital importance to the approximately 14 million philatelists in this country are the size, perforations, and watermarks of stamps in their collections. To aid these hobbyists in making such determinations, Alwil Products Co., Chicago 35, Ill., has developed a combination stamp gage and magnifier, called the Roto-Gage, which utilizes four plastic components to achieve sturdiness, functional design, and lower production costs.

Housing the instrument is a case molded of black Bakelite phenolic in an 8-cavity mold. Scales and instructions are molded-in and wiped with white paint. One end of the housing forms a tray in which watermarks are checked; perforation readings are observed through a slot in the top.

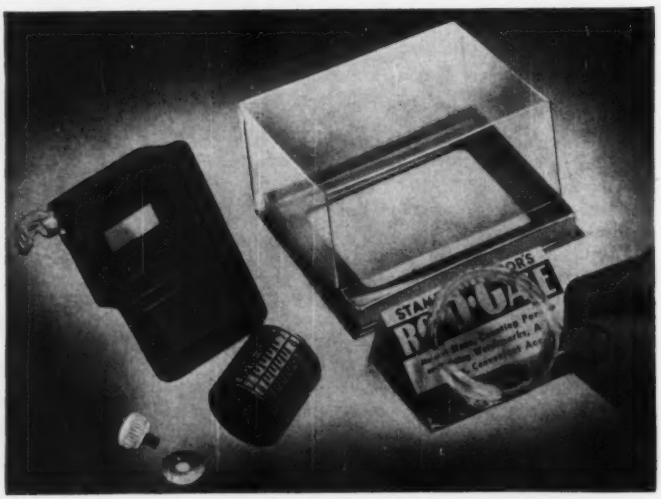
Also of phenolic is the gage drum with an insert into which a knob insert is threaded to support the drum and allow it to rotate. A sheet-aluminum scale is wrapped around this drum.

The knob for turning the gage is produced of white Plaskon urea molded in a 20-cavity die. An acrylic magnifying lens, which replaces glass and provides a 50% cost reduction, may be snapped out of its metal supports for independent use. All plastic parts are molded and assembled for Alwil by Imperial Molded Products Corp., Chicago.

Featured in the Roto-Gage's sales promotion program is a show-case-type display package which combines a die-cut paperboard base and a transparent acetate cover. This merchandising case is supplied by W. C. Ritchie & Co., also of Chicago, Ill.

Checking stamp watermarks and perforations is aided by new device

View of parts includes display package (upper right) which has acetate cover. Acrylic lens (lower right) snaps out of metal supports for independent use



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Organic Red, Maroon,
Blue & Green Toners

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Offerings based on extensive experience with leading plastics manufacturers

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Every Facility That's Needed
To Produce Your Molds

BEEL ENGINEERING CO.

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of dies, molds, tools
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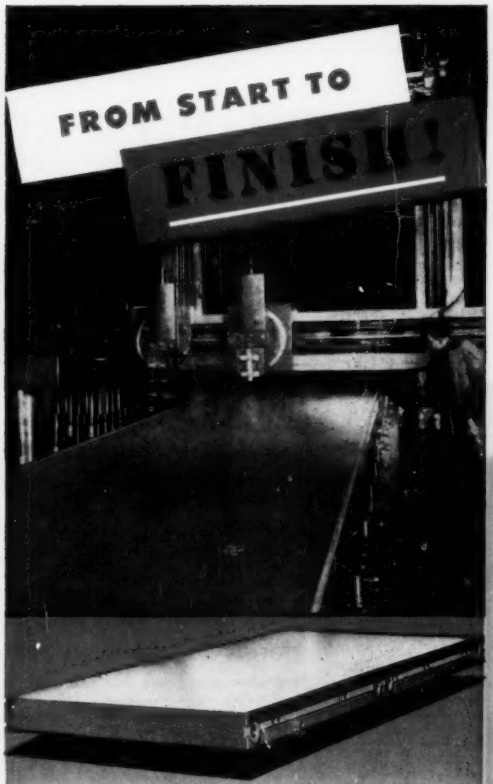

R. D. Wood Rolled Steel Heating Platens Improve Product Quality

PLASTIC or rubber product quality frequently starts at the *finish!* Processing operations—polishing, laminating, bonding, protective coating, and curing—depend in large measure on the *finish* of press heating platens. Widely accepted throughout industry, R. D. Wood rolled steel heating platens are *precision* made in any practical size for the most exacting work. Platen finish is superb, surfaces are machined *parallel*, uniform heat distribution and permanent steam closure are rigidly maintained. Put the *finishing* touch to *your* products by getting the full story from R. D. Wood engineers.

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Many film fabricators have asked us for a unit that would automatically batch narrow widths of film. And we've just designed and built a unit to do the job. ***What widths does it handle? From 24" down to 1".***

Just load the magazine of the Progressive Automatic Batcher with cardboard tubes and set the yardage per tube on the controls. Then, without requiring additional attention, other than replenishment of the tube supply, the Automatic Batcher winds the proper yardage, cuts off the film and starts winding on a new tube!

This remarkably efficient unit, indispensible in any plant fabricating plastic film, is most logically placed at the delivery end of an extruder, a printing press, a calender, an embosser or some other processing machine.

Send for details.

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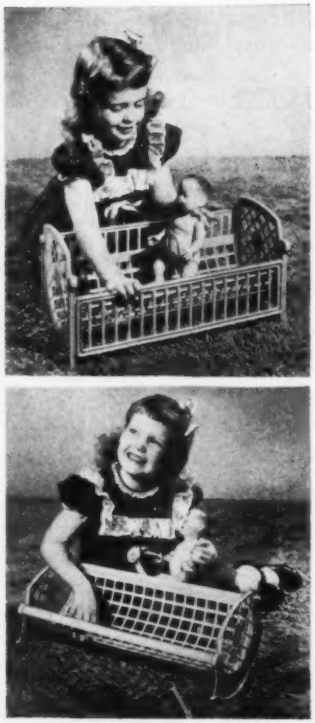


PHOTOS COURTESY CELANESE CORP. OF AMERICA

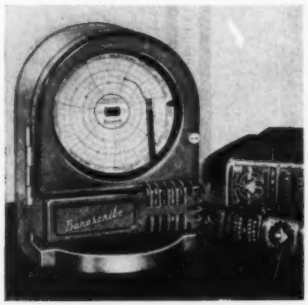
Young "mothers" can play safely with acetate crib and cradle

Crib and Cradle

THE safety factor—in which the use of plastic plays an important role—is stressed in a doll cradle and crib manufactured by Soodhalter Plastic Products, Hollywood, Calif. Molded of Lumarith cellulose acetate by Modern Plastics Co., Los Angeles, the toys have no sharp edges, the material cannot splinter, and no nails are used in their construction—all safety aids.

The crib, with its lattice work design, has an "up and down" side as on a real crib. Measuring 18 in. long, 9½ in. wide, and 8⅞ in. high, it will accommodate a large doll. Light in weight for easy handling, the crib is resilient and tough.

The cradle, which rocks at the slightest touch, is also molded in lattice work design and is 18 in. long, 9¼ in. wide, and 7 in. high. Its one-piece design provides durability for a long and rugged play life.



Phenolic housing provides good appearance, corrosion resistance

Barograph

SEARCHING for a housing material for its recording barometer, Bacharach Industrial Instrument Co., Pittsburgh, Pa., producer of the "Baroscribe," found that phenolic provided the best balance between cost, appearance, and corrosion resistance. The housing molded by Chicago Molded Products Co., Chicago, consists of two parts: the case proper, which is molded with the base in one piece, and the cover of the instrument, which contains the dial opening. The case is produced in a single-cavity steam mold, and the cover from a single cavity hand mold. The name of the instrument is applied by hot rolled leaf.

Case and base are molded in one piece; cover is a separate unit

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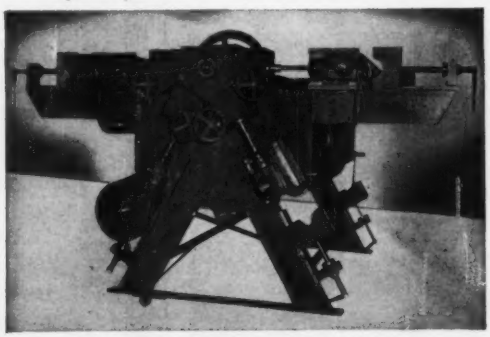

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TWO sheets of acetate 0.005 in. thick, with a special carbon material sandwiched between them, form a labeling tape which has many industrial applications. Markings cannot be smudged or obliterated, because when a label is written with a stylus or pencil, the impression is made on the protected carbon; the exposed surface of the top acetate strip remains clean. Any type of writing instrument can be used, including a typewriter which should be set at "stencil" to achieve best results. In demonstrations by salesmen, ordinary orange sticks have made legible impressions.

Designated Labelon and made by Labelon Tape Co., Rochester, N. Y., the tape is claimed to be acid resistant, oil-, water-, tamper-, and smudge-proof, and capable of withstanding temperatures ranging up to 150° F.

Because of its adhesive backing, Labelon will stick to practically any clean, dry surface. It can be stripped off and reused. Available with either a blue or black edging, the product comes in widths of ¾ or ⅝ in., and in rolls of 500 or 1000 inches. The tape is packaged in its own dispenser, which permits any desired length to be easily torn off, but also fits into any standard-type dispenser. Among the tape's many adaptions, and one for which a heavy demand has been noted, is the identification of equipment or samples during laboratory tests where adverse weather conditions may be present, or exposure to water and acid may occur. It is also useful in cases involving constant handling.

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Fiberglas-reinforced plastics can be the answer to your problems.

These fiberglas-reinforced plastics are molded in forms up to 30" x 48" x 20". They have the highest strength-weight ratio of any material known, will withstand temperatures from —60° F. to 350° F., will not warp or set and are impervious to moisture, acids, alkalis and most solvents. Smooth, excellent surfaces in unlimited colors are easily cleaned.

Illustrated above are a few of the many products made of fiberglas-reinforced plastics. In each case they corrected manufacturer's difficulties encountered when made of any other material . . . and in most cases initial cost and upkeep costs were greatly reduced.

As the world's largest producer of fiberglas-reinforced plastics we have the expensive specialized equipment and the knowledge of product design, die design and production to supply your requirements . . . especially in times when other materials are not available.

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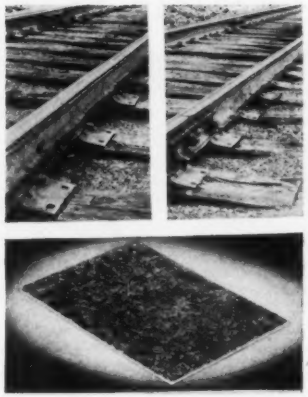

Vinyl pads protected the ties at left. Below: Close-up of the pad

Rail Tie Pads

THE 1,130,000,000 crossties, bridge ties, and switch ties in the railroads of the United States offer a huge market for plastic tie pads such as those developed by F. Burkhart Mfg. Co., St. Louis, Mo. Composed of abaca fiber and Vinylite resins and formed under pressure, the pads are placed between the wooden ties and steel tie plates to absorb the shock and destructive abrasion resulting from heavy rail traffic. Such traffic pounds the natural binding resins out of unprotected wooden ties, permitting the tie plates to cut into the wood and resulting in rot and loosened spikes.

Strong and flexible, the new plastic pads are resistant to oxidation, sunlight, and most chemicals, and do not become brittle in extreme cold or heat. When installed, spikes are driven through the tough elastomeric material which hugs the tie and binds the spikes in place.

The thickness of the pad is a standard $\frac{3}{16}$ in., but the exact size of the tie plate varies with different roads and is frequently governed by the tonnage which moves over the tracks. Thus each pad is tailor-made to fit the particular track for which it is designed. The resin content also varies, although the fibers are always fully saturated.

The company claims that the pads reduce tie replacement 30 to 35%, the expense of tamping the track 20%, and the cost of gaging 50%.

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TRACER-CONTROLLED MILLING. Covered are the principles of operation, some construction details, special equipment and attachments, and the features and specifications of the Keller Type BL for tracer-controlled milling. 12 pages. Pratt & Whitney Div., Niles-Bement-Pond Co. **(9-600)**

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INJECTION MOLDING UNIT. Plast-O-Press, a new ¼-oz. injection molding unit designed for hand operation in a drill or arbor press is described in this folder. Specifications and prices are included. Plastics Development Corp. **(9-607)**

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9-622	9-623	9-624	9-625	9-626	9-627	9-628	9-629	9-630	9-631	9-632
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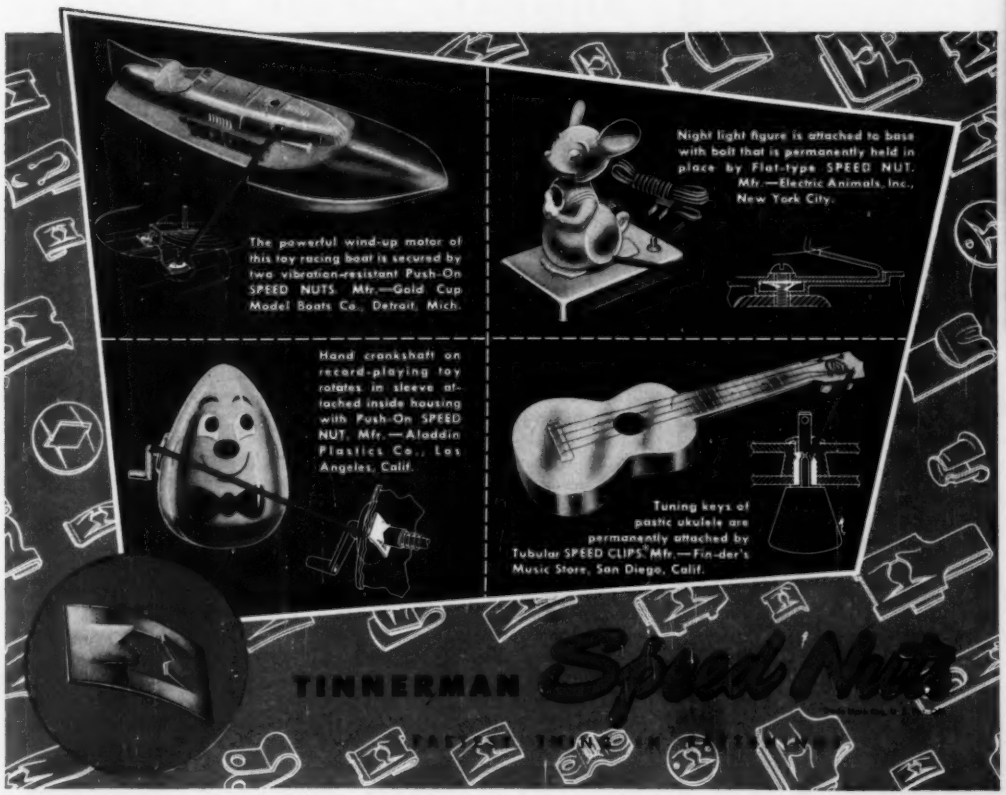
The powerful wind-up motor of this toy racing boat is secured by two vibration-resistant Push-On SPEED NUTS. Mfr.—Gold Cup Model Boats Co., Detroit, Mich.
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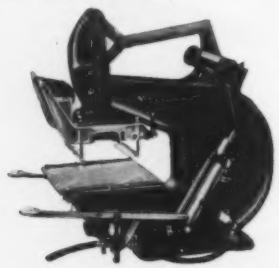

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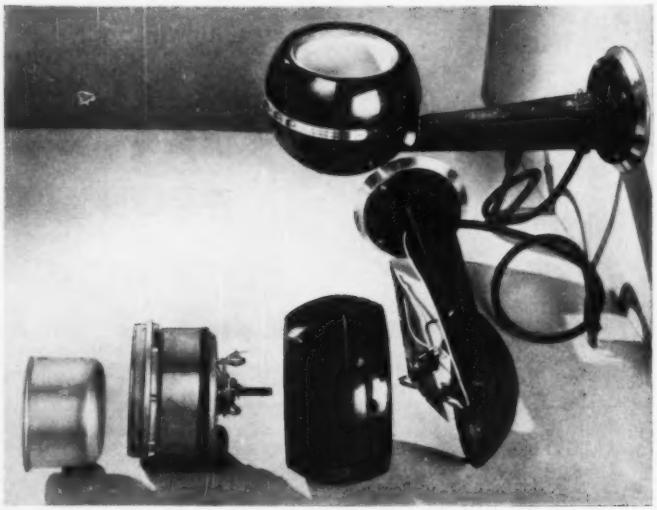

Molded phenolic, providing high heat insulation, houses fly destroyer. Component parts are, left to right, aluminum cup and body, phenolic case

Automatic Electric Fly Control

THE sleek luster of molded black phenolic has been combined with die-cast and drawn aluminum in the production of a revolutionary unit for automatic fly control. Produced by Buehler, Inc., Paramus, N.J., the device is called the Aerovap, and is essentially a thermostatically controlled electric vaporizer. It contains a cup of special insecticide in a heater encased in black phenolic, mounted at the end of a wall bracket. When the current is turned on, the insecticide is volatilized, and fine, invisible particles of it are dispersed. It is claimed that the Aerovap insecticide is harmless to humans, animals, and food-stuffs, and that it will not stain or leave an oily film on any surface.

Certain materials were selected by the designer for functional reasons. Specifications called for the bracket arm and body to be made of die-cast aluminum because of the requirement for strength and high heat conductivity. The need for high heat conductivity and shatter resistance also dictated the use of anodized deep-drawn aluminum for the cup holding the insecticide.

Molded phenolic was chosen for the housing because of its high heat insulation as well as its appearance. Heat insulation is an important factor in this unit, because the temperature of the heater body may rise as high as 160° C.—yet the temperature of the exterior face of the housing must still remain low enough so that anyone touching it will not be burned. Phenolic is also impervious to the insecticide.

The phenolic housing was compression molded in one piece by Boonton Molding Co., Boonton, N. J., from Durite No. 560 black phenolic. An interesting feature in the finishing operation of the housing is that a shallow groove is machined to finish the exterior parting line. This lathe operation serves not only to remove the flash, but also to eliminate the necessity of an expensive buffing operation.

The Aerovap has found many useful applications in food stores, kitchens, restaurants, and residences where protection against pests and disease-bearing insects is desired. Connected to an ordinary wall socket, the unit consumes about the same power as a 60-watt bulb—but only while the thermostat is on, which is about one minute out of every six.

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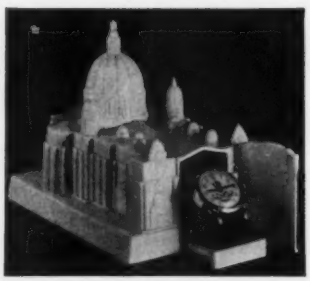
THE spirit of the Holy Year provides the theme of a presentation box designed for Anno Sancto Holy Year watches. The box, an authentically executed replica of St. Peter's Cathedral in Rome, is molded by Tech-Art Plastics Co., Long Island City 1, N. Y. for Cronow Watch Co., New York 18, N.Y. Made in four pieces, including body, dome top, door, and door slide, in a four-cavity mold, the entire box is opaque white styrene, down to the door hinges. The watch rests on the door slide at the bottom, and is exposed to view when the main door is opened.

The dome of the presentation box can be lifted to reveal a cardinal-red lined interior. The box then lends itself to use as a depository for religious articles.

Designed by Bronislaw Zapolski, New York plastics designer, the Anno Sancto presentation box measures 4⅜ in. wide, 4⅝ in. high, and 6⅜ in. deep.

Watch is displayed on slide when main door of cathedral is open



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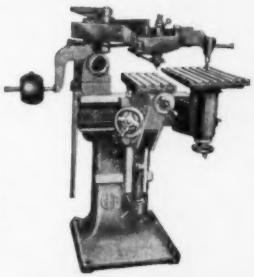

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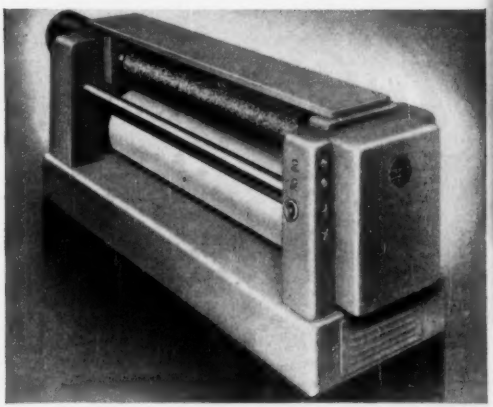

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Vinyls

(*Continued from pp. 73-78*)

flow usually apparent in a clear or slightly tinted material. Molding temperature is carefully controlled and upon removal from the die, the vinyl pieces are placed in a flat position so that they will cure in the desired shape.

Industrial Applications

Business machines offer another important outlet for flexible vinyl plastics. One such application is a twirler knob which is comfortable to the fingers and is not harmed by perspiration or body oils. One of the newest items in this category consists of the molded vinyl feet used by Burroughs Adding Machine Co. for its portable adding machine. The feet carry the weight of the unit, protect the desk or table surface on which it rests, and prevent it from "walking" when operated.

Since these machines are often picked up and transferred to another location, the feet are so curved and positioned that regardless of the angle at which the unit is lifted, the edge of the case cannot scrape the desk surface. Selection of elastomeric vinyl material for this application was based on the toughness of the plastic, its excellent sound and vibration absorbing properties, and its ability to cling snugly to smooth surfaces. Another important consideration was the fact that the material was available in a rich brown color matching the finish of the adding machine case. The feet are molded by the Thermoplastics Div., Chicago Molded Products Corp., Chicago, Ill., using a Vinylite elastomeric compound.

Molded flexible vinyl nipples for automotive distributor caps have long since proved their superiority over similar items made of rubber, and are widely used by the automotive industry. Vinyl distributor cap nipples have long service life, provide excellent electrical insulation, resist water and oils, and possess a tenacious grip. In one laboratory test run at room temperature, nipples of different materials were kept under tension as in actual service and exposed to concentrated ozone for 6 hours. At the end of the test, a natural rubber nipple was ruined and a synthetic rubber nipple cracked, whereas the elastomeric vinyl nipple was still unimpaired.

These materials are also finding other automotive applications. Among them are tiny elastomeric seals which are used to plug distributor cap vents against dirt and moisture during overseas shipment, truck hood bumpers which dampen noise and vibration, and tire valve caps which cut their own threads the first time they are applied and form a tight seal. Other common automotive applications are flexible lock plunger caps and window grommets, such as those molded by Waterbury Companies, Inc., Waterbury, Conn. Some automotive men see elastomeric vinyl as the ideal material for window welting because it wears better than rubber and can be colored to match the car's interior treatment. Pedal pads are another possibility. One of the major independent auto manufacturers may shortly introduce an ingeniously designed arm rest in which an

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internally ribbed, resilient elastomeric vinyl top section or pad is used in combination with a lower section of cellulose acetate butyrate.

Refrigerator door bumpers are injection molded of Geon by The Watertown Manufacturing Co., Watertown, Conn. The pieces have an excellent finish and the proper resiliency to cushion the closing of the refrigerator door. The material was selected because of its moldability and its non-migrating type of plasticizer. "We feel," says E. E. Beadle, Jr., of this company, "that there is a very definite place in the thermoplastic field for this type of material. It adds to our versatility."

The many successful applications cited in the preceding paragraphs, plus a host of additional items ranging from grommets, bellows, and electrical plugs to storage battery bushings, wire terminal sleeves, and water cooler gaskets, graphically illustrate that these materials have indeed won a place for themselves and may be expected to enjoy even wider use as molders and manufacturers become more familiar with their unique properties.—END

Polyvinyl Ester

(*Continued from pp.* 113-120)

same degree of polymerization yields a soft substance. Special polyvinyl esters difficult to obtain by polymerization can be prepared by interchange of ester radicals[40].

Polyvinyl formate is insoluble in hydrocarbons and is mostly used as a gasoline- and benzene-resistant varnish[41].

Vinyl benzoate[42] polymerizes to a high melting product drying from solutions to a glossy, water-resistant film. Mowilith D 2 and D 200 (plasticized) emulsions contain 15% of vinyl benzoate copolymerized with vinyl acetate for increasing the gloss as a paint.

The phenomenon that two monomers, mixed together, do not polymerize separately but result in a copolymer, was observed for the first time in the field of vinyl esters[43]. This copolymerization became one of the most important reactions in the preparation of high polymers, and the mechanism of the formation of copolymers became the subject of several investigations.[44]

Of the copolymers of vinyl acetate[45] the copolymer with vinyl chloride[46] is the most important one. In contrast to pure polyvinyl chloride it has the advantage of being soluble in acetone or solvent mixtures. Therefore, the copolymer has been preferred and employed in the preparation of water- and chemical-resistant varnishes, lacquers, coatings, adhesives, and Vinyon fiber.

An emulsion containing about 46% of solid copolymer of 70/30 vinyl acetate/vinyl chloride is marketed under the trade name Appretan EMW and is used as a textile stiffening agent. Collars treated with it can be washed in the normal way without final loss of stiffness. The copolymer Igelit MP, Grade S, containing equal parts of vinyl chloride and vinyl acetate, is applied in production of phonograph records and for injection molding. At Burghausen polyvinyl chloride shoe soles are made from 90 parts of plasticized pure polyvinyl chloride with 10 parts of the copolymer 30/70 vinyl acetate/vinyl chloride, enabling the soles to be attached to

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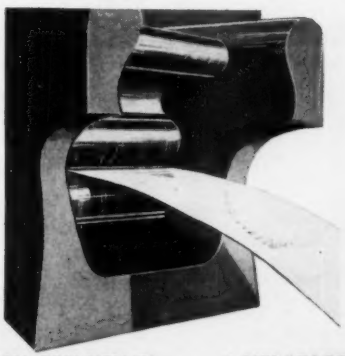

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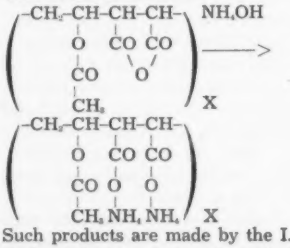
the shoes with common cellulose nitrate adhesive.

Softening point and other characteristics of the copolymer decrease with increasing acetate content. Therefore, only a small percentage of vinyl acetate (5%) sufficient to bring about solubility in acetate or in a similar solvent, is introduced into the resin for Vinyon fiber (softening point 65° C.). A second method to make polyvinyl chloride soluble is by after-chlorination of the pure polyvinyl chloride (Igelit PeCe), a process employed by I. G. Farbenindustrie A.G.; it has the advantage that mechanical properties and softening point are not altered.

Copolymers of higher vinyl-acetate content require less plasticizer than those of lower acetate content to obtain the same softness. The properties of copolymer plastics of equal plasticizer content are shown in Fig. 5; compositions of equal hardness are compared in Fig. 6.

In 1930 it was observed that unsaturated compounds, nonpolymerizable by themselves, such as maleic acid and its derivatives[47], yield copolymers with vinyl compounds. Analogous to vinyl chloride, maleic and fumaric esters copolymerize with vinyl acetate from the smallest portion up to a maximum of 1:1 mole, whereas maleic anhydride results only in copolymers of the proportion 1:1 mole[48]. An excess of vinyl compound polymerizes by itself, and an excess of maleic anhydride remains unpolymerized. The copolymer forms water-soluble salts with alkali or ammonia[48]:



Such products are made by the I.G. Farbenindustrie A.G. and marketed under the trade-name "Povimal" for special applications[35]. Other unsaturated compounds, such as crotonic acid or crotonic esters[50], or unsaturated halogen hydrocarbons, such as di- or trichloroethylene[51], nonpolymerizable by themselves, copolymerize with vinyl esters. In contrast to the copolymers of maleic anhydride small quantities of crotonic acid can be copolymerized. It is possible to obtain copolymers soluble in alkali by adding only 0.5-1% crotonic acid. Appretan H, consisting of 95 parts of vinyl acetate and 5 parts of crotonic acid, polymerized in n-propanol to a k-value of 30, is used as a substitute for shellac as a stiffener for felt hats. Mowilith ABC is a copolymer of 80/15/5 vinyl acetate/vinyl benzoate/crotonic acid, polymerized in a 2:3 n-butanol/methanol mixture to a k-value of 30. It is used as an emulsifier, dressing, textile-finishing agent, and food can lining.

Copolymerization of vinyl esters with unsaturated fatty oils, such as linseed, soy, wood, or poppyseed, brings about compatibility of the vinyl esters with unsaturated oils[52] which is important in the preparation of varnishes. These copolymers (trade-name "Olovin") are compatible not only with fresh linseed oil but also with other polymers, such as polystyrene, polyacrylic esters, polymethacrylic esters, and cellulose

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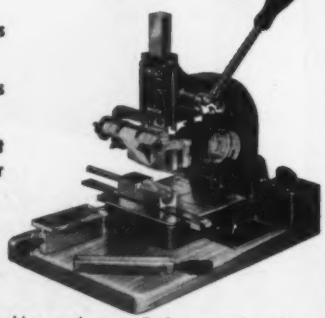

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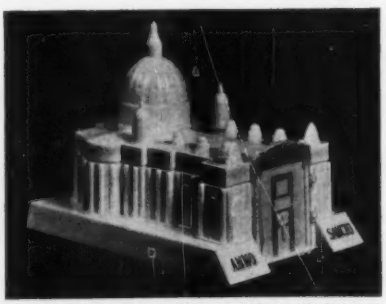

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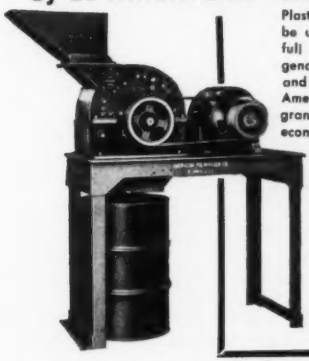

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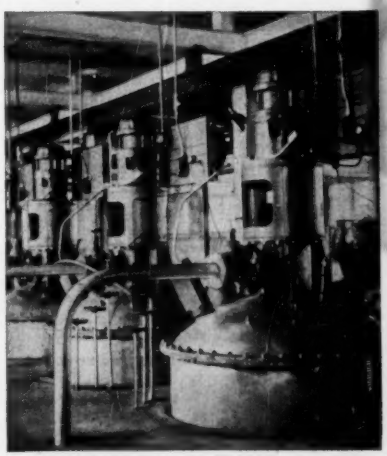

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esters[1]. They can be purified by dissolving in butanol and precipitating by cooling[24].

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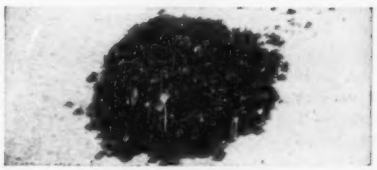

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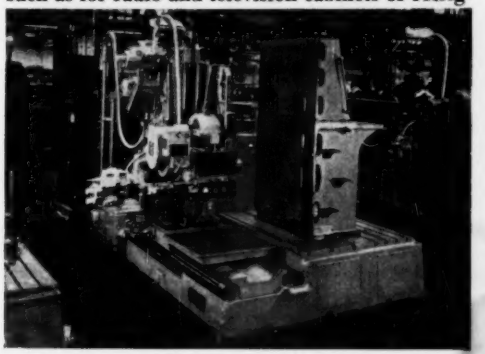

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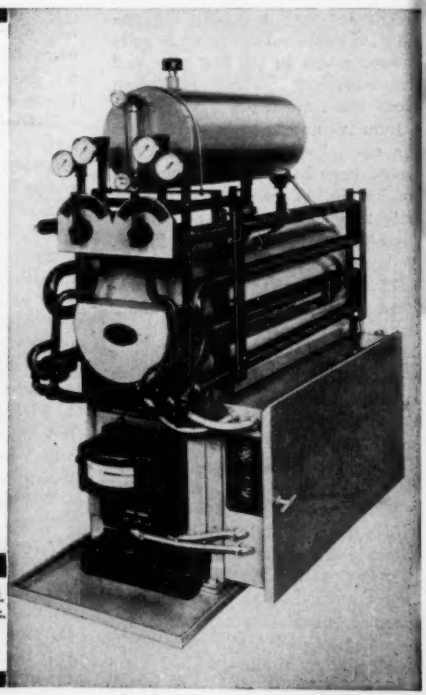

THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Error in Benzol Figures

LAST month a serious typographical error occurred in reproducing the estimated benzol consumption figure for 1950. The amount of benzol needed for aniline should have been 13 million gallons instead of 3 million. Since then the DDT figure has been raised from 3 to 5 million gallons, thus making the total for all benzol needed 178 million gallons instead of the 169 million previously reported.

Acetate Film's Growing Volume

THE Korean incident wasn't necessary to emphasize the scarcity of thin cellulosic and polyethylene film. There has never been a time since the end of World War II when these films were in plentiful supply for very long, but the upsurge of packaged materials in self-service stores in the last year and the increasing volume of frozen foods has emphasized the problem.

Industry authorities claim that in the normal course of events there would have been a demand for 500 million lb. of cellophane, acetate, polyethylene, Pliofilm, and saran films within the foreseeable future. Today a reported production of 240 million lb. of cellophane is insufficient. Acetate film production under 3 gage was nearly 8 million lb. in 1949—has been running well above that rate in 1950 (about 3.7 million lb. in the first four months).

Because of his company's recently completed installation for thin-film extrusion, this department asked David Hopping of Celanese Corp. of America for a review of the acetate film situation. The following is based largely on his comment.

Today, acetate film and sheeting is produced largely by three different methods. The oldest is block sheeting whereby the material is pressed into a large block and then skived or sliced off in thin sheets from 0.005 in. up to almost any desired thickness. Such material is used for see-through windows, side-curtain glazing, printing, and a few other applications. It is the highest priced of the various types but has one advantage—it can be furnished economically in orders as small as 200 pounds.

Cast film or sheeting is produced by the drum process in thicknesses ranging from 0.0007 in. up. Until recently all acetate film under 0.003 in. was produced in this manner, but the new extrusion method is less costly. Celanese is today producing quantities of this type film in 0.00088 in., the same as the most commonly used cellophane.

During the current development stage, extruded film is selling at the same price as cast film, but when major production facilities are completed, probably in 1951, the cost will be reduced, possibly to where it will compete with cellophane.

Extruded film is inferior to cast film in only one respect, says Mr. Hopping. Its optical perfection is not quite as good. Nevertheless, it has good clarity and even better luster. In comparison to cellophane, extruded acetate has good aging qualities, is not affected by temperature and humidity, and it has gas permeability. It could be used in place of moisture-proof cellophane if the latter has been chosen simply for dimensional stability and aging, as in a wrap for candy boxes, but not for such things as soda biscuits which have to be protected with a moisture-proof wrap.

When prices come down, acetate film will find a much larger market for packaging such things as fresh produce and paper products that are more or less hygroscopic. There would be a market for 50 million lb. of acetate film under 0.003 in. today, according to Mr. Hopping, if the price were competitive.

The principal outlets for acetate film and sheeting today, all of which are apparently undersupplied, are:

Base for electrical and industrial tape. One larger producer claims he is getting only one third of the desired amount. Acetate insulation is used in 26 places in a single telephone. A layer of 0.0007 in. is used in the wrapping of relays and holding coils because it is non-corrosive and saves bulk. Acetate tape is also used for spiral winding, particularly on bus-bars and the wire used for electric ranges.

Grease-proof wrap. Known as Ordnance Wrap, this material was developed during the war. It is an acetate lamination over kraft paper or fabric with wax used as an additive. Used particularly for ball bearings and machine parts.

Pipe insulation. This is a laminated wrap similar to the grease-proof material. A bituminous coated pipe is wrapped with 0.001 gage acetate and then over-wrapped with kraft paper.

Laminated to paper. Used for slot insulation of electrical motors.

Laminated to scrim for glass substitute. Used in poultry houses, hot beds, etc. Over 1 million lb. a year used for this purpose.

Laminated packaging materials. One example is a three-layer sandwich consisting of aluminum foil with acetate on one side and Pliofilm on the other. Will withstand −10° F. Used for ice cream mix and dry yeast.

Decorative laminates. Used for book covers, menus, cartons, and certain types of window boxes like those used for Paris garters.

Laminated ribbons. Acetate film laid on unwoven acetate or nylon yarn. Gives high satin decorative effect.

Metal yarns. Acetate film laminated to aluminum foil and slit. Result is tarnish-proof tinsel yarn for dress goods.

Window containers. One of the biggest uses for acetate film and sheeting. Used largely for individually packaged goods—boxes often made in more than million-quantity lots. Used for such things as candy, dolls, toys, women's garments, baby accessories and fresh produce.

Gold stamping film. Used for hats, initials, names, trade-marks. Film is coated with wax on which is de-

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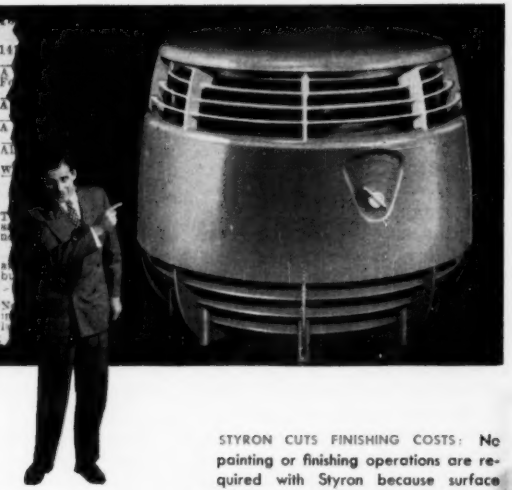

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Blueprints were drawn up that incorporated these features. However, these design and styling lines presented a production problem involving assembling . . . finishing and material costs. Some materials cost too much while others did not meet the necessary physical requirements. It was finally decided that a plastics material was the ideal solution. Using to full advantage the services offered by the Custom Molder and Dow's Plastics Technical Service, the Fresh'nd-Aire Company selected Styron (Dow polystyrene) as the material best suited for the job.

Dow will help you select a Custom Molder who can solve your design and production problems. For extensive information on the properties and performance of Dow Plastics, write today for technical bulletins or advice from Dow's Technical Service.

STYRON CUTS FINISHING COSTS: No painting or finishing operations are required with Styron because surface color goes all the way through. Exact color matching of individual parts was possible in two-tone circulator. Finish stays bright and new looking after shipping and storage because Styron's colors won't chip or peel.

SIMPLIFIES ASSEMBLY: Grille work and cowl of floor circulator are mass produced in one-shot moldings. This eliminates additional assembly operations and reduces total production costs. The dimensional stability of Styron permits the maintenance of extremely close tolerances necessary to the design of the fan assembly.

IMPROVES APPEARANCE: Styron made possible the attractive color and styling features that make this floor circulator outstanding in today's market. A special safety guard and design lines to provide uniform air flow were easily molded with Styron.

Plastics Division—Dept. SOT-46

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posited colored bronze powder over which lacquer is sprayed. When stamped with a hot die, the wax releases the lacquered bronze powder which is thus transferred or stamped to the leather or fabric.

To the above must be added, of course, the afore-mentioned thin film for produce which is an ever-growing market.

For all-out mobilization the items in this list likely to be in greatest demand are electrical insulation, Ordnance Wrap or moisture-vapor barrier material, gold stamping foils for Army caps, shoes, etc., and tape.

Illuminated Control Panels

VINYL and acrylic are being used in an unusual combination for panel lighting on control boards. The material has been perfected and is being marketed by Universal Aviation Corp., 230 Park Ave., New York, N. Y.

The new panel material, in which the lettering is flush with the surface, is an acrylic-vinyl laminate about 0.187 in. thick. The sandwich has a thick inner layer of acrylic which is coated with titanium and then covered on both sides with black vinyl. The edges are sealed with the same vinyl material. The required letters or figures are processed into the black surface of the panel so that the titanium surface shows through, producing dead white characters against a dense, non-reflecting black background.

Aside from the fact that this application is one of the few known examples where acrylics and vinyl have been successfully laminated together, the highly interesting feature of this instrument dial or panel is the lettering which is produced by some undisclosed combination of heat, chemical, and pressure treatment. The technique is completely different from that commonly associated with engraving or etching. The letters or figures are actually in the vinyl surface and, hence, will not rub off, will withstand abrasion, and can be cleaned with a light abrasive or an ordinary detergent. Dirt and dust cannot collect in the characters because the entire surface is smooth and flush. The characters can be read at the widest possible angle, since they are neither engraved nor raised. The panels have been tested at temperatures varying between −85 and +185° F. without affecting their overall efficiency.

For use in darkness, the control-panel is lighted by small red-filtered lamps inserted in the clear plastic medium. The red light flows out through the panel surface at every point where the white translucent undercoating is visible through the black vinyl surface, causing the letters to show clearly in the darkness. The particular tone of red light employed is one which the eye does not retain when in motion; thus, the panel material is particularly valuable in airplane cockpits because the pilot can glance from his instruments into the black night without eye strain or danger of after-image.

The panels can also be provided with windows through which counters or dials are read. If desired, the windows can be made as magnifiers.

In addition to its use in aviation control panels, this new panel is also suggested for use in automobiles and on shipboard for instrument lighting.

Thermoplastics Prices

PRICES for thermoplastics have followed the general industrial pattern with gradual increases that started several months ago. Styrene had increased from a low of 25½ to 28½¢ for crystal at time of going to press. Standard colors in styrene had also been increased but not in the same proportion. The difference between crystal and colored is now only 4¢, thus slightly reducing the spread between crystal and colored. The scarcity and increasing price of benzol is largely responsible.

In early 1950, benzol was 22¢ a gallon. Since then, benzol (derived from coal tar) has increased from 22 to 25 or 27¢ depending upon the geographical location of the user. Benzol from petroleum and imported benzol is in the 40¢ range and even higher, since the imported variety frequently has to be refined before it can be used for styrene monomer. Styrene plastics producers have been dipping rather heavily into these two supplementary sources for benzol.

In the acetate field, prices have risen several cents a lb. in the last three months, and one company has completely discontinued manufacture of what had been its lowest price material.

The raw materials used in acetate manufacture have all gone up in price: cotton linters have risen from 2 to 6½¢ a lb. within a year's time; ethyl alcohol has changed from a price as low as 20 to around 40¢; wood pulp has gone up several percent, and the plasticizers used in acetate have risen considerably.

Furfural

THE offices of The Quaker Oats Co. in Chicago were recently visited to check up on the progress of furfural. The resulting interview indicated that the firm's faith in the future of this chemical—derived from corn cobs, oat hulls, cotton seed hulls and other waste products—is being substantiated. There is a constantly growing market in a variety of end uses that consume steadily increasing quantities of furfural and its derivatives.

Insofar as molded plastics products are concerned, Quaker Oats officials point out that few persons in the industry realize the part that phenol-furfural resins have taken in the development of larger molded pieces. In this connection they assert that the longer flow period achieved with phenol-furfural compounds lessens the tendency to pre-cure in a large piece; the longer flow increases the rate of heat transfer in the molding compound and actually gives a faster cure time for specific deep draw items. Furthermore, a carefully controlled rate of flow produces optimum appearance and strength in the finished article.

(*Continued on p. 176*)

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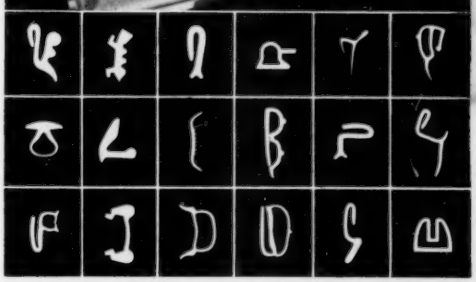

A Few Typical Cross Sections

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Another property claimed by Quaker Oats for phenol-furfural compounds is better wetting of the cellulosic or mineral filler, thus helping to obtain a smooth flow with a resultant high gloss and elimination of flow marks.

The use of furfurals in the resin field is not limited to phenolic resins, since they will also react with urea, casein, lignin, and others to form resinous products, but none of these have yet reached a level of industrial importance.

One of the important furfural derivatives in plastics is furfuryl-alcohol type resins which have been used for a long time in constructing large tanks or vessels by a cast-molding technique. These vessels have been used largely by chemical companies because of their inertness to alkalies and generally good chemical resistance. Furfuryl-alcohol resins are also used as a binder for non-chemical fibrous materials such as glass fibers and insulation batting. One of the greatest potential uses of furfuryl-alcohol is as an anti-corrosion protective coating or agent.

Perhaps the most widely publicized use of furfural in the past two years has been its development as a source for the manufacture of adiponitrile, a chemical intermediate used in the manufacture of nylon. This is particularly significant since it helps to alleviate the shortage of benzol, some 18 million gal. of which have been used in previous years in the manufacture of nylon. Du Pont is now starting another facility in Niagara Falls. The first plant of this type has been operating since 1948.

One of the latest uses for furfural derivatives is in tetrahydrofurfuryl oleate used in high-grade secondary plasticizers. It is not sufficiently compatible with vinyl to be used alone as a plasticizer, but when used with DOP or other standard plasticizers, it helps to contribute flexibility at low temperature.

Among other widely known uses for furfural is in refining lubricating and Diesel fuel oil where it is particularly applicable because of its tremendous solvent action on some of the unwanted parts in an oil mixture. It is also one of the principal chemicals used in refining butadiene and for removing color bodies from wood rosin to produce a light-colored product capable of competing with gum rosin. Moreover, it is used as a solvent for nitrocellulose, cellulose acetate, and other coating materials, particularly in the preparation of stripping lacquers and varnishes for use on metal cans.

For many years, manufacturers of resin-bonded abrasive wheels have used furfural to wet the abrasive granules just before they are added to the pulverized phenolic resin. Furfural is also used in the manufacture of brake linings and in cold molding compounds because a small amount of furfural in the wetting mix improves wetting, plasticity, and uniformity.

Silicone Developments

ACCORDING to the Mellon Institute of Industrial Research, the following four particularly worthwhile advances have been made in the development of silicones during the last year.

1) Silicone rubber, or silastic, has been improved so that high tensile strength and high elongation can be combined in the same material. Previously, one always had to be sacrificed to the other. The following tabulation shows this improvement:

	Tensile	% Elongation
Old	250	200
Old	550	60
New	650	300

In addition, both abrasion resistance and tear resistance are greatly improved.

2) The value of silicones as mold release agents for rubber and plastics has now been incorporated into paper. Paper so treated has been found effective in the linings for containers for tar, as interleaving strips for adhesive materials, and for the handling of tacky solids in general. The paper is also water repellent and might be used for paper rainwear. These new applications have required the development of a new type of impregnating resin.

3) Silicone resins are being used more and more for mixing with other compatible materials to impart some of the excellent properties of silicones. Within the past year a silicone resin has been developed expressly for use with alkyd resins to produce a more heat-stable and light-stable alkyd.

4) Steady progress is being made in the use of silicones as anti-foam compounds. Applications in this field range all the way from stopping the foaming of petroleum oils and alkyd cooks to the alleviation of "bloat" in farm animals.

More Fluorocarbon

INCREASED production of Teflon (tetrafluoroethylene) has been made possible by the construction of new facilities at Du Pont's Parkersburg, W. Va., plant site. The production of Teflon heretofore has been conducted in what was little more than pilot-plant scale at Du Pont's Arlington, N. J., site. Production started there in 1943. The new building has been equipped so production can be easily expanded as demand for Teflon grows. This is the initial expansion for the company's Parkersburg plant, first occupied two years ago, which was erected to produce nylon molding powder, monofilament, and bristles; Lucite acrylics; and Alathon polythene resins.

Molded Photographs

A METHOD of molding photographs to produce a three-dimensional effect has been developed by a government agency. It is believed this process can be applied to black and white or colored photographs and will have commercial value for reproducing advertising displays, aerial photographs, etc.

According to a report in Army Map Service Bull. No. 29, the Relief Map Div. has succeeded in heat forming photographic emulsions coated on rigid vinyl and cellulose acetate base sheets. The process involves plasticizing the emulsion with a 5% solution of ethylene glycol for 10 min. before applying the

Plastics

Imperial Chemical Industries Ltd., produce a wide range of thermosetting and thermoplastic materials. These are offered throughout the world by I.C.I. overseas companies and resident agents, whose names and addresses will be supplied on enquiry.

Imperial Chemical Industries Ltd.,
Plastics Division, Export Department,
Welwyn Garden City,
Hertfordshire, England

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forming heat. This treatment softens the emulsion to a degree where it will not deteriorate during the vacuum forming process.

Two New Plasticizers

TWO new plasticizers are now being distributed by Harwick Standard Chemical Co., Akron, Ohio. The first, classified as Polycizer 332, is an odorless dioctyl adipate which is claimed to be particularly useful in obtaining low-temperature flexibility and good light and heat stability. It is recommended for use as an entire or partial plasticizer with all types of vinyl compounds. A particular claim made for it is that compounds using this plasticizer may be more highly loaded without exceeding the hardness requirements.

The second plasticizer, Polycizer 162, is dioctyl phthalate and is recommended as an all-purpose plasticizer that assures good heat and light stability, excellent stress-strain characteristics, and good low-temperature properties. It is practically colorless and odorless.

Fiber V

SOME of the veil surrounding the new synthetic textile fiber, known tentatively as Fiber V, has been partially lifted by E. I. du Pont de Nemours & Co., Inc. The firm has announced that the new material is a condensation polymer obtained from ethylene glycol and terephthalic acid. It is not chemically related to nylon. Quantities of both continuous filament yarn and staple required for development work are being made in an experimental operation at the Seaford, Del., plant of the Nylon Division. The fiber was first developed in England where it bears the trade-mark Terylene. United States rights to manufacture the patented fiber were acquired by Du Pont in 1946. No decision has yet been made to produce the fiber commercially.

Fiber V is a material that is not weakened by fungus, mold, or mildew, has high tensile strength, and high resistance to stretching—both wet and dry. Fabrics made from Fiber V have excellent resilience and resistance to wrinkling, launder easily, dry quickly, and can be heat set. In the industrial field, evaluation is also being made of fire hose, V-belts, and other applications.

Two Vinyl Stabilizers

CLAIMING outstanding heat and light stability, clarity, and improved life of products as principal merits of its new materials, Advance Solvents & Chemical Corp., 245 Fifth Ave., New York 16, N. Y., has introduced two stabilizers to the vinyl plastics industry. The first, designated D#52, is a low-viscosity liquid permitting easy incorporation into vinyl chloride and copolymer resins, to which the stabilizer is said to give good heat and light stability. This stabilizer is suited for transparent film work as well as rigid vinyl sheeting.

The second stabilizer, called D#21, is a mobile, easily incorporated liquid for straight polyvinyl chloride polymers, and is said to differ from the usual metal-salt stabilizers in that it combines the stabilizing action of cadmium with a radical that is a powerful acid acceptor.

A Different Cable

CLAIMED to be most radically different cable design developed in 25 years is a new plastic-glass fiber insulation cable recently announced by The Plastic Wire & Cable Corp., Jewett City, Conn. Called A-Z Cable, the new product, approved and listed by the Underwriters' Laboratories, has undergone laboratory tests which have been confirmed by field tests under service conditions ranging from —44° to the intense heat that is met in tropical applications. Under installation abuse at —44° it was not cracked or otherwise damaged. It is unharmed by corrosive conditions of almost any sort and can be used in both overhead and underground installations. The compact design made possible by the use of materials having exceptional electrical and physical properties results in a cable occupying a minimum of space in walls, holes, boxes, and so forth, and taking up to 50% less space than conventional wiring materials. A-Z Cable is available at a price lower than some standard wiring materials and at only a slight premium above the least expensive of these cables.

New Plasticizer Plant

BUILT for the production of a complete line of plasticizers, a new plasticizer plant is now in operation at the Neville Island plant of the Pittsburgh Coke & Chemical Co. Phthalate- and phosphate-type plasticizers, polymeric-type plasticizers, and a number of esters of adipic and sebacic acid will be produced in the new plant.

Flame-Retardant Insulation

DEVELOPED in the laboratories of the Polychemicals Dept. of E. I. du Pont de Nemours & Co. Inc. and now available in commercial quantities is a plastic electrical insulation which will not support combustion nor drip when molten. Known as Rulan, it is said to be non-tracking and to retain its electrical properties after immersion in water for long periods at elevated temperatures. Its low-temperature properties are classified by the producer as excellent, and its mechanical properties as good.

Rulan is widely adaptable to electrical insulation applications where flamability is a factor, such as insulation for high-voltage circuits, signal controls, television lead-ins, etc.

COMPANY NEWS

Applied Engineering Associates has moved to new quarters at 139 East 57th St., New York 22, N. Y. In addition to general consultation for the plastics industry, the company produces specialty equipment such as ovens for use in high vacuum metallization of plastics and automatic equipment for injecting reinforcing wire into plastic optical temple pieces.

Wheelco Instruments Co., Chicago, Ill., has opened a sales office in Grand Rapids, Mich., which will operate under the supervision of the Detroit district office with **R. P.**

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Campbell as assistant district manager. **Don C. Walley** is St. Louis, Mo., district manager and is succeeded by **Warren F. Paetz** in the central Illinois and Iowa territory. **Samuel M. McDevitt** has been transferred to the New York office and **Edward F. O'Brien** will replace him in the Philadelphia office. **Tom Mitchell** has been transferred to Boston.

Poly Perm Printing, Inc., 64 West 23rd St., New York, N. Y., formerly A. Heribert Co., has been formed for the purpose of printing glass and plastics, including polyethylene bottles, closures, etc., and also for pre-treating polyethylene bottles for custom decorators so that subsequent printing will become permanently bonded to the polyethylene. Officers are **Mrs. A. Heribert,** president; **S. Sonneberger,** vice president; **E. A. Geiger,** treasurer; and **M. R. Geiger,** secretary.

Balassa Research Laboratories, New York and West Barrington, R. I., has acquired space at 59 Cove St., New Bedford, Mass., where a new development laboratory is now under construction. The new facilities will be principally for cellulose and textile research, with additional projects on plastics and starches. The new laboratory is scheduled to be in operation in the fall of 1950.

The Durethene Corp., 55th Ave. at 19th St., Chicago 50, Ill., producer of polyethylene products has announced the opening of a New York office at 175 Fifth Ave., headed by **George Goodridge.**

Vansul & Co., Englewood, N. J., has initiated an intensive development program toward producing color dispersions and master batches for the vinyl plastic field. **Herbert H. Watjen** has been named technical director of this program.

Ross & Roberts, Inc., 350 Fifth Ave., New York 1, N. Y., has adopted the trade-name "Reet" for the company's unsupported vinyl film and sheeting which is being produced at plants in Stratford, and West Haven, Conn. A new line of embossed film is scheduled for production by mid-July, the first pattern being taffeta, to be followed by moire, herringbone, and others.

Loma Plastics, Inc. is now in operation at its new plant at 3000 W. Pafford St., Fort Worth 10, Texas, which has four times the space formerly occupied. By October, five injection molding machines will be in operation for a total capacity of 150 ounces.

Tennessee Eastman Corp. has announced that delivery of plasticizers and solvents can now be made from its Kingsport, Tenn., plant by tank trailers.

Godfrey L. Cabot, Inc., Boston carbon black manufacturing concern, has announced the following personnel changes: **John Andres** has been named general manager of the newly created **Plasticizers Div. David Duke Cochrane** was elected a vice president of the company.

The Flambeau Plastics Corp., formerly located in Bruce, Wis., has announced the opening of its new plant in Baraboo, Wis. The newly expanded facilities will be adapted to industrial custom molding.

Hercules Powder Co.'s Synthetics Dept. has announced three new appointments: **Henry Thouron,** director of sales; **B. H. Little,** district sales manager in Boston; and **Howard C. Bates,** special sales representative in New England.

National Lead Co., 111 Broadway, New York, N. Y., has announced two new stabilizers for vinyl resins. Called Dutch Boy Plumb-O-Sil "C" and "D", they are used primarily in translucent compounds and are said to impart heat and light stability to vinyl plastics.

Moore Plastics, San Antonio, Texas, has been established for custom molding thermoplastic items up to 8 oz. in size.

Reiss Associates has announced the recent merger of the plant facilities of its affiliate, **Laminated Plastics,** with its main unit. Henceforth, all operations at both the Newton, Mass., and Boston plants will be under the direct management of Reiss Associates, with a combined factory area of over 80,000 feet.

The Lea Mfg. Co., Waterbury, Conn., manufacturer of polishing and buffing compounds, has announced two new products. Leabrament is a greaseless, non-flammable, quick-drying liquid abrasive for burring and polishing which can be sprayed or brushed on wheels and is suitable for hand or automatic production methods. Leament is a liquid polishing cement which is claimed to have flexibility and long life.

Catalin Corp. of America, 1 Park Ave., New York, N. Y., has announced the beginning of operations at the company's new plant at Calumet City, Ill., which is producing a full range of phenolic, melamine, urea, and resorcinol resins for gluing, laminating, crease proofing, bonding, and impregnating methods.

Ferro Chemical Corp., Bedford, Ohio, has announced the appointment of **A. C. Nispel, Inc.,** sales agent for the states of the New England area. Headquarters are at 131 Beverly St., Boston 14, Mass.

General Electric Co., Schenectady 5, N.Y., has announced the following personnel changes: **John L. Busey** has been elected a vice president of the company in charge of marketing policy, a newly-created post, with **William V. O'Brien** his assistant manager. **James F. Somers** of the Chemical Dept. has been named to the Detroit sales office on phenolic compounds and resins, and **Howard L. Franks** has been named manager of sales personnel and control in the same department.

Nesco, Inc., is the new name of the National Enameling & Stamping Co. of Milwaukee, Wis. Nesco has always been the name of the company's products and the stockholders have voted to change the company name because the trade mark was far better known than the actual name of the company.

Plastic Assembled Products Co., producer of special closures for the biological and pharmaceutical industries, plans construction of a new plant, a one-story building having

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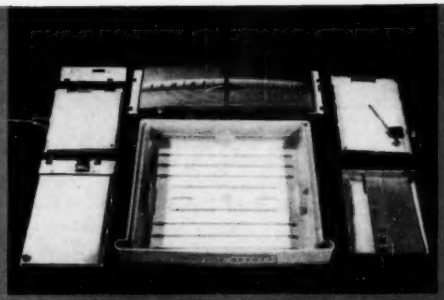

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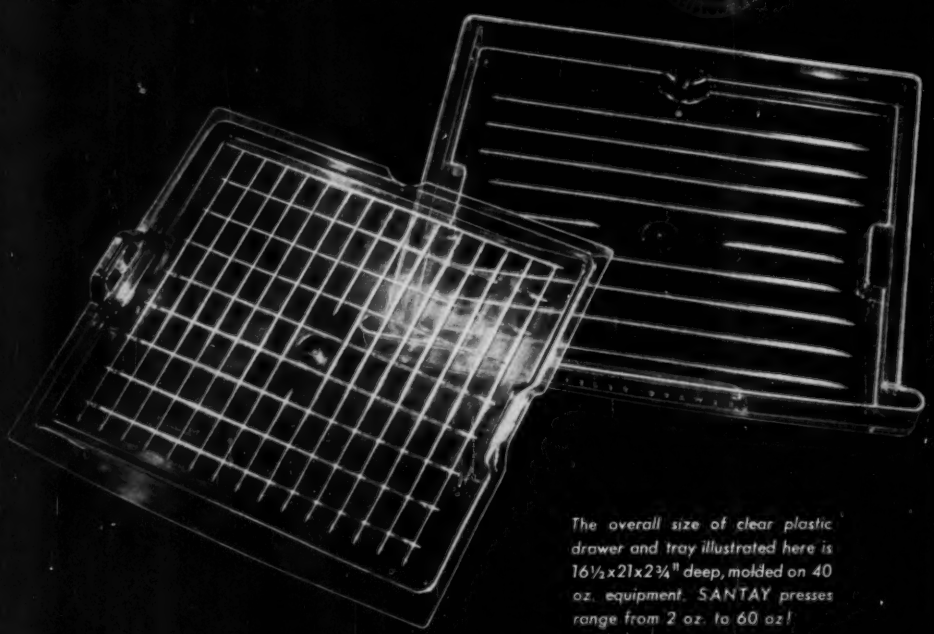

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40,000 sq. ft. of floor space, to house the different departments now scattered throughout downtown Baltimore, Md.

National Lead Co., 111 Broadway, New York 6, N. Y., has announced plans for the construction of new facilities for production of titanium pigments. The additional capacity, expected to increase the present rate by 60,000 to 70,000 tons annually, will be added first at the company's St. Louis plant.

Fabricon Products, Inc., Plastics Div., has announced the opening of a New York technical sales office at 220 East 42nd St. **Joseph T. Galvin**, who has been transferred from the main office in River Rouge, Mich., will be in charge.

Free State Art Plastics, Inc., 8 Pennsylvania Ave., Cumberland, Md., manufacturer of plastic point-of-sale signs, has announced its change to a corporate status. Services still offered include the forming and decorating of thermoplastic sheet. Additional designing and architectural activities will be under the supervision of **S. Russ Minter**, vice president. **Arthur C. Morgan** is president.

Plax Corp., Hartford, Conn., has appointed **Mailler Searles, Inc.**, San Francisco, Calif., as West Coast distributor. **The Glenn H. Taylor Co.**, which handles Plax products in southern California, will continue to represent the company under the supervision of Mailler Searles.

The M. W. Kellogg Co., refinery and chemical engineer of Jersey City and New York, has announced the sale of the stock and assets of one of its subsidiaries, **The Kellex Corp.**, to **The Vitro Mfg. Co.** in a move to concentrate the company's commercial development, engineering, and manufacturing efforts in the petroleum, chemical, and power fields. Contracts currently held by Kellex, which are mainly in the field of atomic energy, will be continued by that organization.

Kepler Engineering Co., 451 W. Market St., Akron, Ohio, has been appointed exclusive representative for Hydro-Line air and hydraulic cylinders for Ohio and northern Kentucky.

Commercial Plastics & Supply Corp., distributor of acrylic and acetate sheets, rods and tubes, has moved to larger quarters at 55 Prince St., New York 12, N. Y.

PERSONAL

Frederick C. King has been named technical representative of the **Synthetic Fibers Dept., Carbide & Carbon Div., Union Carbide & Carbon Corp.** Mr. King was previously associated with Burlington Mills and E. I. du Pont de Nemours & Co., Inc.

A. C. Young has joined the **Plaskon Div., Libbey-Owens-Ford Glass Co.**, as representative for molding compounds on the West Coast with headquarters at 816 West Fifth St., Los Angeles 17, Calif.

James H. Watt is now assistant branch manager of plastics sales in **Monsanto Chemical Co.**'s Los Angeles office. He has been with the company since 1932.

Dr. John B. Davidson has joined **Plaskon Div., Libbey-Owens-Ford Glass Co.**, Toledo 6, Ohio, as a technical department group leader in charge of silicone and industrial chemical research. He succeeds **Dr. David B. Hatcher** who became sales manager for glues and industrial resins with the same division.

O. Ivan Lee has joined **United States Testing Co., Inc.** as chief spectrographer.

Robert Vignolo has been appointed Pacific Coast sales manager for **Baker Castor Oil Co.** with offices at the company's plant at 5585 E. 61 St., Los Angeles 22, Calif.

George E. Vybiral has been named director of engineering for **Panelyte Div., St. Regis Paper Co.**, 230 Park Ave., New York 17, N.Y. He has been with Panelyte Div. since 1940.

R. H. Juve has been appointed technical sales representative for **Ferro Chemical Corp.**, Bedford, Ohio, a subsidiary of **Ferro Enamel Corp.** He was previously associated with Goodyear Tire & Rubber Co., American Texolite Co., and Pennsylvania Rubber Co.

Dr. Rolston L. Bond has been appointed assistant chairman of the chemistry and chemical engineering department at Armour Research Foundation of Illinois Institute of Technology.

Clayton F. Ruebensaal has been appointed technical director of plastics and resins for **Naugatuck Chemical Div., United States Rubber Co.** He will assume direction of all research, process development, and technical service activities pertaining to Kralastic molding powders, Vibrin polyester resins, Marvinol vinyl resins, and PQL resins for enamels. He will make his headquarters at the division's main plant in Naugatuck, Conn.

MEETINGS

Sept. 5-9—Chicago Section of the American Chemical Society, Sixth National Chemical Exposition, Chicago Coliseum, Chicago, Ill.

Sept. 10-13—American Institute of Chemical Engineers, Regional Meeting, Radisson Hotel, Minneapolis, Minn.

Sept. 25-29—National Association of Corrosion Engineers, Cast Institute of Technology, Cleveland, Ohio.

Oct. 16-20—National Safety Congress and Exposition, 38th Session, La Salle Hotel and Morrison Hotel, Chicago, Ill.

Oct. 18-20—S.P.I. Annual National Conference, New Ocean House, Swampscott, Mass.

Oct. 24—Association of Consulting Chemists and Chemical Engineers, Annual Meeting, Hotel Shelburne, New York, N. Y.

Nov. 1-3—The American Society of Body Engineers, Fifth Annual Convention, Rackham Memorial Building, Detroit, Mich.

Nov. 2-3—Industrial Management Society, 14th Clinic, Sheraton Hotel, Chicago, Ill.

Nov. 6—35th National Hotel Exposition, Grand Central Palace, New York, N. Y.

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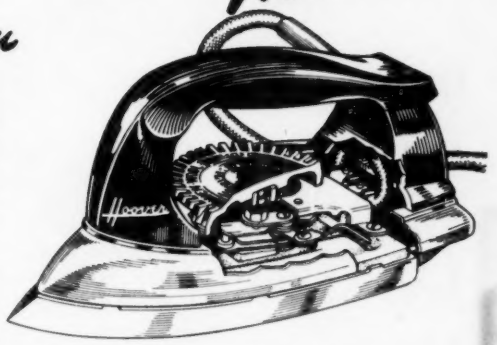
Northern keeps its promises. When it tells you that its designers, engineers and molders will add extra smartness, long life, or special sales appeal to your plastic product or part — that is exactly what you will get. The reason? Northern's 40 years of experience using *all* plastic compounds gives it an expert knowledge of *how* and *when* to use them, and how best to mold *each* one.



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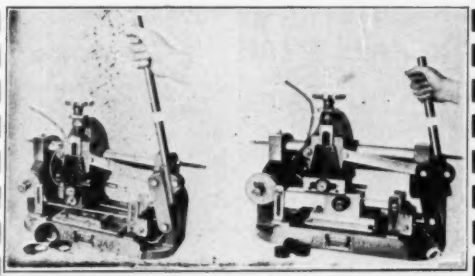

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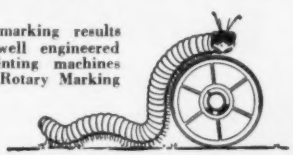

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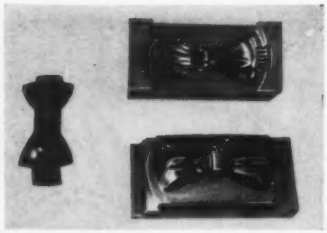
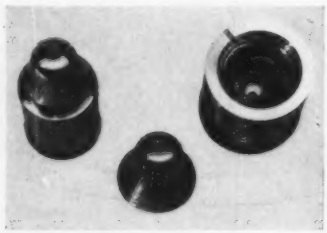
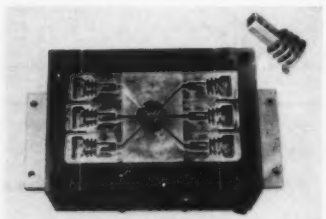


Mold for decorative consumer item. SAMSON EXTRA supplied excellent hobbing for sharp detail on cavities and force plugs.



6-cavity mold for ladies' cosmetic container. Perfect finishes on over 1 million parts to date with SAMSON EXTRA.



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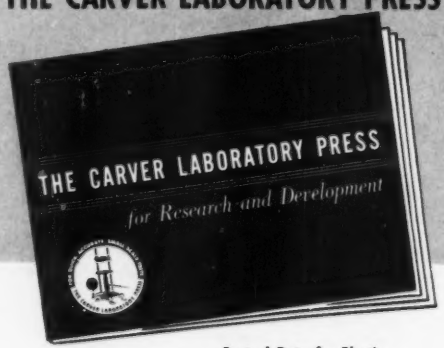

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The simplicity of operations with Dryply has opened new doors in polyester low pressure laminating. Now, production speed and production economy can be attained without any noticeable revisions in present manufacturing setups. This new reinforced material elevates the low pressure field to equal other mass production methods. Cured parts can now be formed at as fast a rate as 15 seconds.

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Dryply comes in ready-to-form rolls. . . . No liner. . . . Unrolls like a roll of paper. You just cut your patterns to desired size and thickness and store left-over pieces for future use. Remember, Dryply can be stored for six months or longer under normal room temperature.

HERE'S WHAT DRYPLY SAVES YOU

You save TIME through speed of application. . . . You save LABOR because there are fewer operations and unskilled personnel can do the job. . . . You save MATERIAL since there is no waste.

DRYPLY is used in forming by:

(a) Male and Female Molds
(c) Pressure Bag Forming
(b) Cellophane Wrap
(d) Vacuum Bag Forming

Ready to Form

Right Off the Roll

Nothing to Add

Wet Lay-Ups Eliminated

DRYPLY has many uses for many industries

AIRPLANE AUTOMOBILE

REFRIGERATION AIR CONDITIONING

TELEVISION RADIO TOY

BOAT ELECTRICAL PACKAGING

also Prototypes and Models

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Dryply has proven to be extremely versatile. Day by day, new uses are discovered and its application is becoming widespread in a variety of industries. We invite you to learn all about Dryply.

ABC operations with DRYPLY

- A—Cut Material
- B—Place on Form
- C—Cure Under Heat and Pressure

DRYPLY NOW AVAILABLE IN BOTH GLASS MAT AND CLOTH

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6 MONTHS
OR LONGER
At Normal Room Temperature

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EMPLOYMENT • BUSINESS OPPORTUNITIES • EQUIPMENT (used or resale only)

Machinery and Equipment FOR SALE

FOR SALE: 100 Ton and 150 Ton Stokes Molding Press & Pumps; 200 Ton H. P. M. Self Contained Molding Press; 300 Ton Dunning & Boschert Molding Press; 300 Ton W. S. New Hobbing Press; 300 Ton W. S. Press 24 x 20 Platens; 175 Ton H. P. M. 30 x 30 Platens; 85 Ton Stewart Bolling 20 x 20 Platens With Electric Plates; 50 Ton 18" x 18" Elmes, With Electric Plates, Handpump Operated; 500 Ton Waterbury Farrel 2 Post Press; 800 Ton Waterbury Farrel 22" x 24" Platens; Watson-Stillman 75 Ton 15" x 15" Platens; 100 Ton W.S. 18" x 18" Self Contained Press; Carver & Watson Stillman Lab. Presses; Hydro Pneumatic & other types Accumulators; Piston & Oil Pumps. AARON MACHINERY CO., 45 Crosby St., N.Y.C.

FOR SALE: 1 oz. Van Dorn injection molding machine late 1947; Farell 18" x 45", 16" x 48" & 15" x 36", 2 roll rubber mills. New 6" x 12" Lab. mixing mills & calenders. Other sizes 30" to 84". Royle #2 perfected extruder, and other sizes. 500 ton Hydr. molding press 42" x 48". Field 500 ton 25" x 30". 200 ton F.B. Hydr. Molding Press 40" x 32"; 300 ton D & B Molding Press 26" x 30". Francis 175 tons 24" x 18". W.S 115 ton 2 opening 24" x 24". 40 ton broaching press. Also presses 20 to 500 tons from 12" x 12" to 36" x 36". Record Presses. Hydr. oil pumps, Vickers, Oilgear, Northern, etc. Watson Stillman hor 4 pigr. 1½" & 2½" x 4" H & L pressure pump. HPM 1—5" x 6" vertical triplex 10 GPM 2700 lbs. Elmes 1" x 4" & 1—1½" x 4" horz. 4 pigr. & 8 GPM 4500 lbs. & 5500 lbs. Elmes 2" x 6" Horiz. 30 GPM 2500 psi. Rumsey 4½" x 8" vert. triplex 65 GPM 900 lbs. Hydr. steam pumps. Low pressure pumps 150 to 600 lbs. Hydr. accumulators. Stokes automatic molding presses. Colton #4½ single punch preform tablet machine 1½" dia. Stokes rotary preform tablet machines 1—3/16", 1—¼" and ⅝", also single punch. Injection molding machines 2 oz. to 16 oz. Baker Perkins jacketed mixers 200, 100, 50, and 9 gals. capacity. Leominster 5 hp. plastic grinder. New and used rotary cutters, #18H Mikro pulverizers, & other sizes. Rubber mills, calenders, #00 Banbury mixer, etc. Heavy duty mixers, grinders, pulverizers, gas boilers, etc. Partial listing. We buy your surplus machinery. Stein Equipment Co., 90 West St., N. Y. 6, N. Y. WOrth 2-5745.

HYDRAULIC PRESSES REBUILT TO SPECIFICATIONS for plastic items, industrial purposes and phonograph record presses. We have in the used equipment (1) Baldwin-Southward 8" x 8' stroke, 2000# W. P. weighted accumulator $2000, (1) 400 ton, 32 x 45, 18" ram, 36" stroke, 12' daylight $3200 (1) 300 ton 30 x 48, 18" ram, 24" stroke, $1800, (1) 400 ton 32 x 36, 16" ram, 18" stroke, 36" daylight $1500, (3) 150 ton 42 x 48, 12" ram, 30" stroke, 60" daylight $900 each, (6) 250 ton 32 x 66 12" double ram, 48" daylight, 15" stroke, Sange type packing $1850 each. Hydraulic Sal-Press Co., Inc., 336-390 Warren Street, Brooklyn 2, New York.

FOR SALE: Stokes Rotary Pellet Presses. B&J #1 Cutter. Double Arm Mixers from Lab. size to 300 gal. Stainless Steel Tanks from 15 gal. to 6700 gal. PERRY EQUIPMENT CORP., 1529 W. Thompson St., Phila. 21, Penna.

FOR SALE: 1 Model 2 Bambury with 40" Mill equipped for plastics. Now in operation. Full flood lubrication throughout. Excellent condition. Available in 60 Days. Reply Box 655, Modern Plastics.

FOR SALE: Injection Presses: 2 & 6 oz Reeds, 4 oz oil htd. HPM, 3 oz Munton, 1 oz vert. bench NRM, 1 oz hd. op. Van Dorn. Extruders: NRM Lab bench unit, 2½" oil htd. NRM, 3¼" dbl. ext. oil htd. Royle.

1—Cumberland Granulator No. 1½. Ovens. 3—Mold Temp. Circulators. 1—Apex rd obj. Printing mach. 1—HPM 9 oz Hastelloy Heat. Chamber. 2—Electronic HF Generators & Sealers f. Vinyls. 500 ton HPM and 300 ton Watson Stillm Compression presses. 1—150 ton Stokes mod. 252 autom. Closure press. 1—Laminat press mult. op. 36x60" plat.—1—Kux No 25 rotary, 2—Colton 4½T. 1—Stokes No 280C Preformpresses.—1—Northrop 6 stat. Micromax Temp. control recorder. 1—Eclipse 3HP Gasboiler. Justin Zenner. 823 W. Waveland Ave., Chicago 13, Ill.

FOR SALE: Lupo Tumblers—all sizes, single, double and multiple set-ups. New and rebuilt. LUPO RESEARCH LABORATORIES, INC., 99-11 Columbus Ave., Tuckahoe, New York, TUckahoe 3-2900.

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LATE-TYPE INJECTION MACHINES
One—10H-22 oz. Reed-Prentice
Two—12 oz. Lester-Phoenix
Five—8 oz. Lester-Phoenix
One—8 oz. Leominster
Three—6 oz. Lester-Phoenix
Six—4 oz. Lester-Phoenix
Two—4 oz. HPM
Machines Available for Inspection
Reply Box 660, MODERN PLASTICS

SAVE WITH GUARANTEED REBUILT EQUIPMENT — HYDRAULIC PRESSES, 24" x 24", 18" ram 318 tons; 24" x 56", 450 ton multiple opening; 24" x 24", 16" ram, 250 tons; 24" x 24", 12" ram, 170 tons; 24" x 42", 2—12" rams, 340 tons, 42" x 42", 16" ram, 250 tons; 36" x 36", 12" ram 141 tons; 20" x 18", 10" ram, 118 tons; 20" x 20", 10" ram, 118 tons; 19" x 24", 10" ram, 78 tons; 22" x 15', 8' ram, 75 tons; 27" x 21', 8" ram, 75 tons, 15" x 15", 8" ram, 75 tons; 12" x 12" 7½" ram, 60 tons; 12" x 12", 6½" ram, 50 tons; 8" x 9½", 4½" ram, 20 tons; 16" x 16", 3½" ram, 12 tons; Laboratory Presses; 10 ton Carver 6" x 6"; 50 ton Stillman 30 ton, 6" x 6"; Laboratory Millsand Calenders (NEW) M. D.; THROPP Mill 16" x 40" M.D.; NEW DUAL PUMPING UNITS, all sizes; EXtruders; Royle Rubber #2, Royle Plastic #1, PREFORM PRESSES, Stokes T, Colton, 5½T and Stokes DD84 with Reeves Drives, also Mixers, Vulcanizers, Accumulators, etc.
Universal Hydraulic Machinery Company, 285 Hudson Street, New York City 13, N. Y.

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LARGE RAM
MULTIPLE OPENING PRESSES
We are selling for a customer the following:—
I—Lake Erie (New 1948) 42" x 42" platen, 8 opening, self-contained semi-automatic Hydraulic Hot Plate Press, 36" dia. ram, with 2 lift tables.
I—Southwark 42" x 42" platen, 4 opening, self-contained semi-automatic Hydraulic Hot Plate Press, 32" dia. ram, with 1 lift table.
UNIVERSAL HYDRUALIC MACHINERY CO.
285 Hudson Street, New York 13, N. Y.

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FOR SALE: Complete wood flour mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars address Box 672, Modern Plastics.

FOR SALE: 1-#00 Banbury Mixer with 10HP motor; 1-Farrel 6" x 13" 2-roll Lab. Mill with motor; 6-Baker Perkins Double Arm Mixers 100, 50, 9 and 2 gallon capacity; 2-Ball & Jewell #3½, 2, Rotary Cutters with 50HP motors; 1-12" x 12" Hydraulic Press steam heated platens; 1-Devine #18 Vacuum Shelf Dryer 15-39" x 59" shelves; Stokes Presses Single Punch and Rotary. Partial listing. Send us your inquiries. BRILL EQUIPMENT COMPANY, 2401 Third Avenue, New York 51, N. Y.

Machinery and Equipment WANTED

New manufacturer wants injection molding machines, also extruding equipment. Will pay good prices. Reply Box 649, Modern Plastics.

WANTED: Extruders:—1" Laboratory Unit Royale or equal. Also 2½" & 3½" extruders and possible larger units. MOSLO MACHINERY COMPANY, 2443 Prospect Ave., Cleveland 15, Ohio. MAin 1-8864.

WANTED: 8-oz. or larger injection molding press, scrap grinding machine and/or other equipment wanted for our shop. Give make; model; year made; serial number, of any; true condition and best price. Write: Production Manager, Box 3586, Oklahoma City, Okla.

WANTED: Universal Plastics Testing Machine. Interested in obtaining a Baldwin Southwark MTE or PTE testing machine complete with grips, extensometer recorder and other accessories. Indicate condition, price, where it may be seen and itemized accessory list. Reply to PURCHASING DEPARTMENT P. O. Box 1531, Springfield, 2, Mass.

INJECTION MOLDING MACHINE WANTED, Watson-Stillman, 1 or 2 ounce, or similar. Write Box MP 1108, 221 W. 41 St. N.Y.

Materials Wanted

WANTED: PLASTIC Scrap or Rejects in any form. Acetate, Butyrate, Polystyrene, Acrylic, Vinyl Polyethylene, etc. Also wanted surplus lots of phenolic and urea molding materials. Custom grinding, magnetizing and compounding. Reply Box 648, Modern Plastics.

WANTED: PLASTIC SCRAP or REJECTS in any form: Cellulose Acetate, Butyrate, Polyethylene, Polystyrene, Vinyl, Acrylic and Ethyle Cellulose. Reply Box 650, Modern Plastics.

WANTED: Your Scrap Vinyl, Polyethylene, Polystyrene.
OFFERING: Reprocessed Pelletted or Granulated Plastic Materials. Custom Grinding & Pellettizing. Reply Box 656, Modern Plastics.

(Continued on Page 188)

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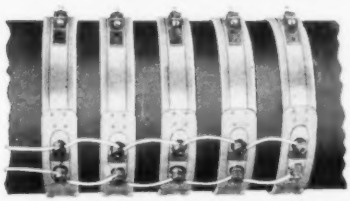

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Now! non-curling inks for Blotch patterns.

ATLAS COATINGS CORP.

5-35 47th Ave., Long Island City 1, N. Y.

CLASSIFIED ADVERTISING

(*Continued from Page 186*)

WANTED: Surplus Inventories of Virgin Injection Molding Compounds in any inventories from 1,000 pounds up. Dussi-Wallace and Company, 60 East 42nd Street, New York 17, N. Y.

WANTED: Plastic Scrap, Rigid Vinyl, Cellulose Acetate, Polystyrene, Polyethylene, Butyrate. Custom grinding, magnetizing, compounding, and straining of contaminated plastics. Franklin Jeffrey Corporation, 1671 McDonald Avenue, Brooklyn, N. Y. ES 5-7943.

Molds Wanted

WANTED: Used Molds for toys, household articles, hairgoods, and novelties, suitable for injection machines up to 16 oz. Reply, if possible with samples or illustrations. Reply Box 670, Modern Plastics.

WANTED: Obsolete molds in good condition, for toys, dinnerware, glassware and novelties. Please submit samples and full details. Supreme Sales Co., 1480 So. Robertson Blvd. Los Angeles 35, Calif.

INJECTION MOLDS WANTED: Reputable Southern manufacturer. We will purchase or rent molds for toys, housewares, novelties or packaging containers. Reply with price, samples and complete information on molds to Box 671, Modern Plastics.

WANTED: Used or new molds for all kinds of novelties, household appliances, barretts, side combs, toys, buttons and cigarette holders for 2 ounce capacity Van Dorn injection press. Will consider anything you have. Please send samples and descriptions to H. Farahnik, 401 Broadway, New York, N. Y. Tel. CAnal 6-7414.

Molds For Sale

Molded Fashion Button Tool Inserts for 22, 28 and 36 line Shank and Through-hole Buttons of modern design, mostly 36 cavities for sale. Further 26 line Underwear and 18 line 4-hole Shirt Button Compression Molding Tools. All in working condition. Apply Box No. 2627X, G.P.O., Melbourne, Australia.

Tools for Children's Educational Toys, Mail Boxes, Pyramids, Telephone Rattles, Telephone Money Boxes, Lunch Boxes, Smokers' Sets, Soap Boxes, Trinket Bowal, Brush Holders and Compacts for sale. Write Box No. 2627X, G.P.O. Melbourne, Australia.

ACTIVE DIES FOR SALES

Mail Box dies complete for phenolic material. Excellent condition. Injection three-inch house number mold also available. Reply Box 652, Modern Plastics.

Help Wanted

MECHANICAL ENGINEER: experienced in plastics injection molding. Complete knowledge of mold designing and modern production methods. Excellent opportunity with well established injection molder in northern New Jersey. Submit resume. All replies kept confidential. Reply Box 651, Modern Plastics.

WANTED: Sales representation by Chicago Molding Company in midwest territory on commission basis. Compression Molding only. Press capacity 75 to 400 ton. A very good opportunity for salesmen or manufacturers agent familiar with plastic molding.
SNOW PLASTICS CORPORATION.
5840 So. Oakley Avenue,
Chicago 36, Illinois.

Draftsman—experienced in plastic product design—creative talent and engineering ability—Newark Area—submit resume and salary expected—excellent opportunity—all replies confidential—Box 657, Modern Plastics.

Injection Molding Department Supervisor to supervise operation of 5 machines. Must have at least 15 years experience in molding, with 5 years in supervisory capacity. Reply Box 658, Modern Plastics.

MECHANICAL ENGINEER: Experienced in designing and drawing compression and injection molds. Capable of talking intelligently with customer on his requirements. Thorough knowledge of Stokes molding presses. Salary commensurate with ability. Firm located in Maryland. Replies handled in confidence. Box 663, Modern Plastics.

EXTRUSION ENGINEER to take charge of plastics extrusion dept. for wire, cable, shapes and sheet material Must have knowledge of die design. Location: Chicago. Reply Box 664, Modern Plastics.

INJECTION PLANT MANAGER: For progressive Michigan molder with 12 machines. Only man thoroughly familiar with injection machines and experienced in production management and cost estimating considered. Attractive proposition for right man. Write complete details to Box 666 Modern Plastics.

TECHNICAL ASSISTANT TO SALES MANAGER—For large midwest injection molding plant. Must have thorough background in mold building and design, under 40 years of age, to locate in midwest. Sales experience not necessary but must be sales timber and willing and able to work for opportunity. Reply Box 668, Modern Plastics.

PLASTIC MOLD DESIGNER—For large midwest injection molder Splendid opportunity to develop in sales for aggressive hard working young man. Reply Box 669, Modern Plastics

Plastic Engineer—Injection Molding—who knows mold Construction and Value. Good knowledge of capable mold sources—East and Middle West. Our Personnel know of this ad. Write Box 653, Modern Plastics.

PLASTICS CALENDERING SUPERVISOR for vinyl film with broad experience in operation and mechanics of calendering and associated equipment; knowledge of effects of formulation variables upon calendering operation. Engineering background preferable but not essential. Administrative ability essential. New England location. Give full details in first letter addressed to Robert F. McCoole, Monsanto Chemical Co., 1700 South Second St., St. Louis, Mo.

Situations Wanted

EXECUTIVE: PLASTIC ENGINEER. Graduof age, to locate in midwest. Sales experience in the plastic field. Experienced in supervision, department head. Extensive experience in injection, compression, transfer, and low pressure molding and laminating. This covers production, product design, drafting, development, estimating, sales service, physical and chemical testing. Have written technical articles. Advancement more important than salary. Age 34. Locate in Midwest. Reply Box 654, Modern Plastics.

Opportunity for plastics company contemplating entering toy field Extremely capable designer, ideaman, experienced background largest toy companies. Thoroughly familiar with the market and it's needs. Technically, artistically and creatively sound." Reply Box 659, Modern Plastics.

PRACTICAL PLASTIC MAN: Married, age 39, desires position with small molding company, or someone just entering the field. Have 20 years of on the job experience in injection, compression and transfer molding. Understand equipment and methods in all phases of production, having previously been instrumental in setting up a successful operation in the middlewest. Am cost minded. Available immediately. Location unimportant. Reply Box 673, Modern Plastics.

PLASTICS TECHNICIAN
EXPERIENCED IN CASTING POLYESTER AND PHENOLIC RESINS: Complete practical knowledge of production, development, engineering and plant design. **VINYL SLUSH MOLDING:** Knowledge of every phase of production. Fully capable of erecting and operating plant. Reply Box 674, Modern Plastics.

Plastics Engineer: Chemical engineer, B. S. Long experience in resins and molding compounds, especially phenolics. Supervisory experience: planning and directing pilot plant research, process and product development, applications laboratory, commercial plant operation and control, improvement of manufacturing techniques to lower costs. Additional experience: technical service to molders, sales engineering, specifications, patents. Desires responsible position. Available immediately. Reply Box 661, Modern Plastics.

VINYL TECHNICAL MANAGER, Age 34—Film, sheet, extrusions, coated fabrics. Executive with leading converter and distributor. Thoroughly acquainted with entire Vinyl Industry. Development; Quality Control; built and maintained laboratory; specifications; fabrication; printing; coating; laminating; trouble shooting; technical sales liaison; direct contact with customers. Committee Member S.P.I. Listed, "Who's Who In Plastics". Many years in Plastic Industry. Reply Box 665, Modern Plastics.

Miscellaneous

ATTENTION MANUFACTURERS: Plastic Sales Organization run by Plastic-Chemical Engineer desires additional representations on Industrial and Commercial items for New England. We call on all types of industrial and commercial accounts. Complete background in all phases of the plastic industry. Excellent technical and sales service. Reply Box 667, Modern Plastics.

Patent now pending on useful plastic article for the kitchen and dining room. Should retail for thirty cents. Since there has always been a demand for an item of this nature the sales possibilities should be enormous. Will require large manufacturing plant to handle. Article available on royalty basis. Address Guy M. Hamilton, 1654 North Decatur Road N. E., Atlanta, Ga.

FOR SALE— 50 Tons Isobutyl Methacrylate Polymer. Box 107 Wall Street Station, New York, N. Y.

FOR SALE: 500 Pounds Barium Ricinoleate; vinyl stabilizer and lubricant. Samples upon request. For full details write Box 662, Modern Plastics.

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For further information address Classified Advertising Department, Modern Plastics, 122 E. 42nd St., N. Y. 17, N.Y.

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The outstanding properties are ease of molding, permanent flexibility, good chemical resistance, color stability and durability.

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Independent Testing Laboratory reports Watson-Standard plastisols show no appreciable evidence of plasticizer migration.*

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Decorative lacquers are now available as an additional service to the plastic molder. These lacquers are made specifically for adhesion to plastisols.

Let us help you with molding problems. Write today.

*Copy of laboratory report will be mailed on request.

Send for your copy of technical paper entitled "Slush Moldings." It's free!

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225 Galveston Ave. Pittsburgh 30, Pa.

INDEX OF ADVERTISERS

SEPTEMBER 1950

Acheson Colloids Corporation .. 131
Acromark Co., The 183
All Purpose Gold Corp. 135
Allied Chemical & Dye Corp. The Barrett Div. 123
American Anode Inc. 14
American Cyanamid Company, Industrial Chemicals Division 129
American Cyanamid Company, Plastics Dept. 108, 109
American Insulator Corp. 72
American Molding Powder & Chemical Corp. 68
American Pulverizer Co. 169
American Screw Co. 41
Amsco Packaging Machinery, Inc. 134
Anderson Bros. Mfg. Co. 145
Apex Machine Mfg. Corp. 179
Atlas Coatings Corp. 187
Atlas Valve Company 184
Avery Adhesive Label Corp. .. 60

Bakelite Division, Union Carbide and Carbon Corporation .....Inside Back Cover
Ball & Jewell, Inc. 150
Bamberger, A., Corp. 137
Barker & Davis Machine Co., Inc. 165
Barrett Division, The, Allied Chemical & Dye Corp. 123
Beel Engineering Co. 153
Bethlehem Steel Company 62
Black-Clawson Co., The 165
Blake & Johnson Co., The 41
Boonton Molding Co. 30
Borden Company, The, Chemical Division 55
Bridgeport Moulded Products, Inc. 50
Bristol Paper Products, Inc.... 134
Buttondex Corporation 191

Cabot, Godfrey L., Inc. 145
Cambridge Instrument Co., Inc. 163
Camcar Screw & Mfg. Corp. ... 41
Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corp. 119
Carpenter Steel Co., The 184
Carter Products Corporation .. 8
Carver, Fred S., Inc. 184
Catalin Corporation of America 1
Celanese Corporation of America, Plastics Division 9, 35
Central Screw Co. 41
Chicago Molded Products Corp. 4
Chicago Show Prin..ng Co. 38
Claremont Waste Mfg. Co. 112
Classified 186, 188
Columbia Protektosite Company 66
Columbian Carbon Company, Magnetic Pigment Division .. 166
Continental Screw Co. 41
Crucible Steel Company of America, Tool Steel Division 71
Cruver Mfg. Co. 46
Cumberland Engineering Co. Inc. 27

Deakin, J. Arthur, & Son 165
Dennis Chemical Co. 179
Diemolding Corporation 158
Distillation Products *Industries*, Div. of Eastman Kodak Co. .. 26
Dow Chemical Company, The .. 173
Drakenfeld, B. F. & Co., Inc. .. 175
du Pont de Nemours, E. I., & Co. (Inc.), Polychemicals Dept. 7
Durez Plastics & Chemicals, Inc. .....Inside Front Cover

Eagle Tool and Machine Co. .. 150
Eastman Kodak Company, Cellulose Products Division 143
Elco Tool & Screw Corp. 41
Erie Engine & Mfg. Co. 175
Erie Resistor Corp. 25

Fabricon Products, Inc. Plastic Div. 164
Farrel-Birmingham Co., Inc. .. 53
Fellows Gear Shaper Co., The, Plastics Machine Division ..42, 43
Ferro Chemical Corporation ... 139
Ferro Enamel Corporation 146
Fiore, Wm. M Inc. 155
Flexfirm Products 185
French Oil Mill Machinery Co.. 138

General Electric Company 125 & Back Cover
General Industries Co., The ... 147
Gering Products Inc. 51
Glidden Company, The 61
Goodrich, B. F. Chemical Co. .. 3
Goodyear Tire & Rubber Co., The, Chemical Division 37
Great Lakes Screw Corp. 41

Hardesty Chemical Co., Inc. ... 167
Harper H. M., Co., The 41
Hercules Powder Co. 21
Heyden Chemical Corporation .. 45
Hinde & Dauch Paper Co., The 31
Hydraulic Press Mfg. Co., The .. 44

Imperial Chemical Industries Ltd. 177
Industrial Heater Co., Inc. 166
Industrial Mfg. Corp. 185
Industrial Research Lab., Ltd. 164
International Nickel Co., Inc. 169

Jackson & Church Co. 58, 59
Jamison, H., Plastics 156

Kentucky Color & Chem. Co. Inc. 153
Killion Tool & Mfg. Co. 183
Kingsley Stamping Machine Co. 168
Koppers Company, Inc. 47
Kuhn & Jacob Molding and Tool Co. 138
Kurz-Kasch, Inc. 17

Lane, J. H. & Co., Inc. 169
Lembo Machine Works, Inc. ... 156
Lester-Phoenix, Inc. 20
Lucidol Division, Novadel-Agene Corporation 170

Manco Products Co. 168
Marblette Corporation 115
Mearl Corporation, The 155
Metasap Chemical Company ... 56
Michigan Chrome & Chemical Co. 191
Michigan Molded Plastics Inc. .. 144
Midland Die and Engraving Co. 96
Mills, Elmer E., Corp. 39
Minnesota Plastics Corp. 22
Mission Pak Company 152
Mitts & Merrill 171
Modern Plastic Machinery Corp. 13
Molded Products Corp. 40
Molded Resin Fiber Co. 157
Monsanto Chemical Company, Organic Chemicals Division .. 19
Monsanto Chemical Company, Plastics Division 29
Mosinee Paper Mills Company .. 121
Moslo Machinery Company 156
Muehlstein, H., & Co., Inc. 163

National Lock Co. 41
National Rubber Machinery Co. 18
National Vulcanized Fibre Co. .. 145
Naugatuck Chemical 141
New Hermes, Inc. 130
Newark Die Company 171
Nixon Nitration Works 12
Northern Industrial Chemical Co. 183
Norton Laboratories, Inc. 69
Novadel-Agene Corporation, Lucidol Division 170

Olsen Mark Corporation 162

Parker-Kalon Corp. .....36 & 41
Pheoll Mfg. Co. 41
Phillips Screws 41
Pittsburgh Coke & Chemical Co. 23
Pittsburgh Plate Glass Co., Columbia Chemical Division . 63
Plaskon Div., Libbey-Owens-Ford Glass Co. 101-104
Plastic Molders, Inc. 32
Plastic Molding Corporation ... 149
Plax Corporation 57
Progressive Machine Co., Inc. .. 154
Prophylactic Brush Co. 54
Pyro Plastics Corporation 49

Quaker Oats Co., The 52
Quinn-Berry Corp. 28
Quarnstrom Tool Co. 163

R & K Products Co. 137
Radio Receptor Co., Inc. 179
Recto Molded Products, Inc. ... 134
Reed-Prentice Corp. 11
Reynolds Metals Co. 64
Richardson Co., The 6
Rockford Screw Products Co. .. 41
Rohm & Haas Company, The Resinous Products Division .. 33
Royle, John & Sons 171

Safety Car Heating & Lighting Co., Inc., The 148
Santay Corporation 181
Schulman, A., Inc. 138
Scovill Mfg. Co. 41
Shakeproof Inc. 41
Sillcocks-Miller Co., The 190
Sinko Manufacturing & Tool Co. 187
Southington Howe, Mfg. Co., The 41
Standard Tool Co. 135
Stanley Chemical Company ... 144
Sterling Electric Motors 136
Stokes, F. J., Machine Co. 24
Stricker-Brunhuber Corp. 131

Tennessee Eastman Corporation. 117
Tennessee Products & Chemical Corp. 67
Thermo Electric Co., Inc. 149
Thropp Wm. R., & Sons Co. ... 137
Timken Roller Bearing Co., The . 34
Tinnerman Products, Inc. 161
Titanium Pigment Corp. 48
Toledo Scale Company 131
Tupper Corporation 16

Union Carbide and Carbon Corporation, Bakelite Division Inside Back Cover
Union Carbide and Carbon Corporation, Carbide and Carbon Chemicals Division 119

Van Dorn Iron Works Co., The 133
Varcum Chemical Corporation .. 10

Wales-Beech Corp. 41
Waterbury Companies, Inc. ... 136
Watlow Electric Mfg. Co. 187
Watson-Standard Co., The 189
Watson-Stillman Co., The 15
Welding Engineers, Inc. 70
Westchester Plastics Inc. 151
Western Felt Works 148
White, S. S., Dental Mfg. Co. .. 170
Windsor, R. H., Ltd. 65
Witco Chemical Co. 127
Wood, R. D., Company 153
Worcester Moulded Products Co. 192

Yardley Plastics Co. 175

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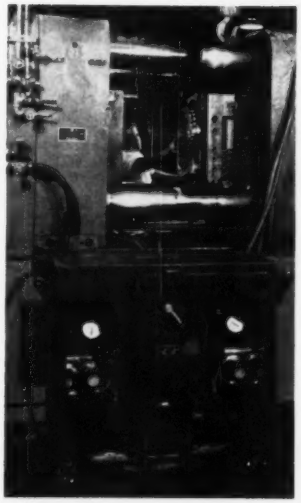

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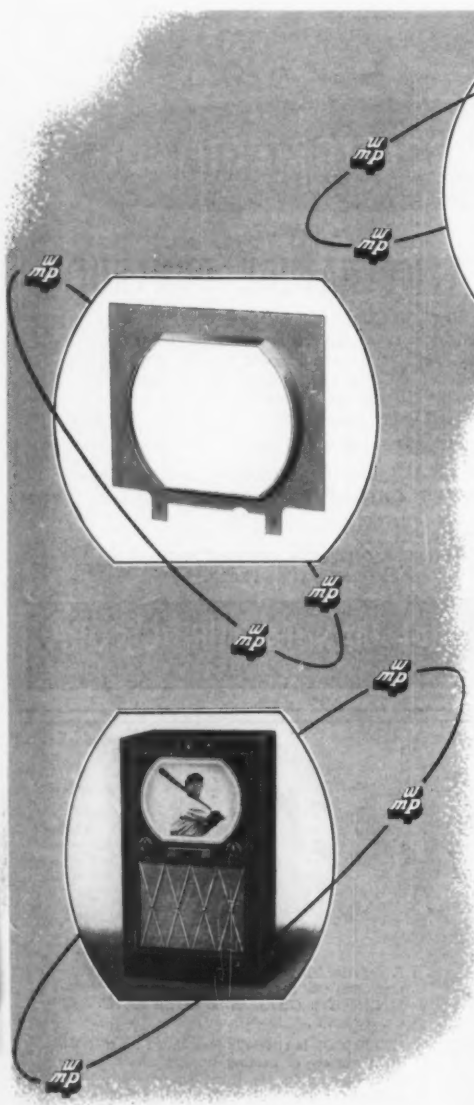

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